SIEMENS

MAMMOMAT 1000/3000/3000 Nova

[redacted] SP

Service

Service Program

from SW 4.0

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Description of the syntax used in these instructions

<.....>	The indication of which function keys to press is given between these characters, for example <ENTER>, <ESC> etc.
CAPITALS	Capital letters indicate data which must be entered unchanged, for example the name of a register, files etc.
Italics	Italics represent data in which a value should be entered, e.g. for user name, the name of the technician should be entered.
[.....]	Square brackets enclose additions to commands which may be optionally entered.
Bold	Data relating to formats, user entries etc., which is important for the following entry, is shown in bold as it appears on the monitor screen.
————	This character indicates that at this point the space key must be pressed.
xx yy zz	Data can be entered in place of *"x, y, z"* (e.g. day´s date).
{...}	Curved brackets indicate that out of several terms listed one below the other, one must be selected.
	Important remarks are indicated with this box.
* * * * *	When the password is entered, only these characters are shown.
Menu Selection:	When several menus, programs, files etc. are presented for selection, they are shown in a box (program window). Selection is made with the <↓> and <↑> keys. The module selected is highligthed in the display.
<ENTER>	Every entry must be confirmed with the <ENTER> key.
<ESC>	ESC allows paging back through the program.
<xx> + <y>	Some functions are selected by pressing two keys simultaneously. Procedure: Press, for example, the <Shift> key and keep it depressed, press the <*> key and then release both keys.
<F1>	Key <F1> calls up a selective help text.
<F10>	Key <F10> exits the program.
PLD	Programmable Logic Device on the AEC board (D701).
Flash	Memory device on the AEC board (D701).
OS	Operating System, e.g. "Microsoft® Windows®"
BIOS	Basic Input and Output System, a program stored in the computer hardware which launches start-up functions upon computer power-up.

XXX - - XXX - - This shows where a particular subroutine can be found.
XXX - - XXX For example:

Main menu –
Configuration –
AEC–
Sensitivity correction-

Connecting the service PC

The service PC used must meet the following requirements:

- RAM minimum 4 MByte
- Type minimum 386SX/25MHz
- HD minimum 2.5 MByte free memory

The service PC must be connected with connecting cable part no. 99 00 440 RE999 to the PC board in the generator. (Do not insert the diskette in the drive yet).

Configuration of the service PC

All Service Programs use the RS232 port in order to communicate with the MAMMOMAT. This port is usually handled as COM1 by the OS of the service PC. Modern PC's can be equipped with new types of communication hardware, e.g. infrared port and built-in modem, which may act as COM1 or share resources with COM1. This could cause malfunction of the Service Programs for the MAMMOMAT, which requires the OS and computer BIOS to be re-configured.

The following procedures are designed to ensure general compatibility with the OS's Windows® 95, Windows® 98 and Windows® 2000 Pro on modern PC's. If the settings are saved, this procedure has to be done only once.

Configuration of computer BIOS

1. Enter the BIOS setup, usually done by pressing e.g. <F2> during the boot sequence of the BIOS.
2. Find the configuration of the IrDA (Infrared device) port and disable it.
3. Find the configuration of a built-in modem and make sure it is configured as COM3.
4. Find the configuration of COM1 and make sure it uses the interrupt IRQ 4 and the memory address range 03F8 - 03FF.
5. Save the BIOS settings and restart the PC.

Configuration of Windows®

(This example is for Windows® 2000 Pro. Windows® 95 and Windows® 98 have a similar approach, consult the OS documentation for details.)

1. Choose Settings from the Start Menu.
2. Choose Control Panel.
3. Choose System.
4. Choose the tab Hardware.
5. Press the button Device Manager.
   If the IrDA-port was disabled in the computer BIOS, it should not be present in the list of available hardware. If the IrDA is present anyway and its icon is not marked with a red cross:
6. Double-click on the device row.
7. Choose the tab General In the appearing dialog box.
8. In the section Device Usage, change the status to "Disabled in the current hardware profile".
9. Exit the dialog by pressing the OK-button.

Having performed the described configurations above, the Service Program should be able to run without difficulties.

Starting up and using the service PC - Service program

1. Switch on generator and service PC.
   After initialization, the service PC shows: **C:\>**
2. Now insert the diskette with the service program.
3. Select the appropriate drive $\begin{matrix}\{A:\}\\{B:\}\end{matrix}$ and then press <ENTER>. The screen shows: **A:\>** or **B:\>**
4. Start the service program by typing "SERVICE" (extension -c if you have a color display), then press <ENTER>.
   The program asks for the user's name: ***Your name, please***
   Type the name of the technician, for example NN, and then press <ENTER>.
5. The program asks for the password: ***Password, please***
   Type the password (********) and then press <ENTER>.
6. The display window shows: ***PROGRAM-MODE; Mode: Normal***
   If ***Mode: Normal*** is the correct choice then press <ENTER> or
   if ***Mode: Stand-alone*** is wanted press the <SPACE> key once and then press <ENTER>.
   The display window shows: ***Main menu***
7. Select the program part to be used with keys <↑> and/or <↓>, then press <ENTER>.
   The program part selected is shown with a background: ***Configuration***
   If necessary, additional subroutines can be similarly selected here.
8. Make the necessary entries in the appropriate part of the program. Save the entered data with <F2>. Page back in the program with <ESC>. The appropriate instructions are shown on the monitor.

End the procedure with the service PC with <F10>.

Starting up and using the service PC - Dose Calculation program (Dose calculation applies if SW 4.4 or higher)

1. Switch on generator and service PC.
   After initialization, the service PC shows: **C:\>**
2. Now insert the diskette with the dose calculating program.
3. Select the appropriate drive $\begin{matrix}\{A:\}\\\{B:\}\end{matrix}$ and then press <ENTER>. The screen shows: **A:\>** or **B:\>**
4. Start the service program by typing "DOSE_CFG", then press <ENTER>.
   The program asks for the user's name: ***Your name, please***
   Type the name of the technician, for example NN, and then press <ENTER>.
5. The program asks for the password: ***Password, please***
   Type the password (********) and then press <ENTER>. This is the same password that is used for the regular service program.
6. The display window shows: ***PROGRAM-MODE; Mode: Normal***
   If ***Mode: Normal*** is the correct choice then press <ENTER> or
   if ***Mode: Stand-alone*** is wanted press the <SPACE> key once and then press <ENTER>.
   The display window shows: ***Main menu***
7. Select the program part to be used with keys <↑> and/or <↓>, then press <ENTER>.
8. Make the necessary entries in the appropriate part of the program. Save the entered data with <F2>. Page back in the program with <ESC>. The appropriate instructions are shown on the monitor.

End the procedure with the service PC with <F10>.

Troubleshooting

If communication with the MAMMOMAT still cannot be established, follow the instructions in this section. The following procedure will disable the buffering of the RS232 port. (This example is for Windows® 2000 Pro. Windows® 95 and Windows® 98 have a similar approach, consult the OS documentation for details.)

1. Choose Settings from the Start Menu.
2. Choose Control Panel.
3. Choose System.
4. Choose the tab Hardware.
5. Press the button Device Manager.
6. Expand the row Ports.
7. Double-click on the COM1 row.
8. Choose the tab Port Settings.
9. Press the button Advanced.
10. Uncheck the check box Use FIFO Buffers.
11. Exit the dialog by pressing the OK-button.

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Configuration

System type

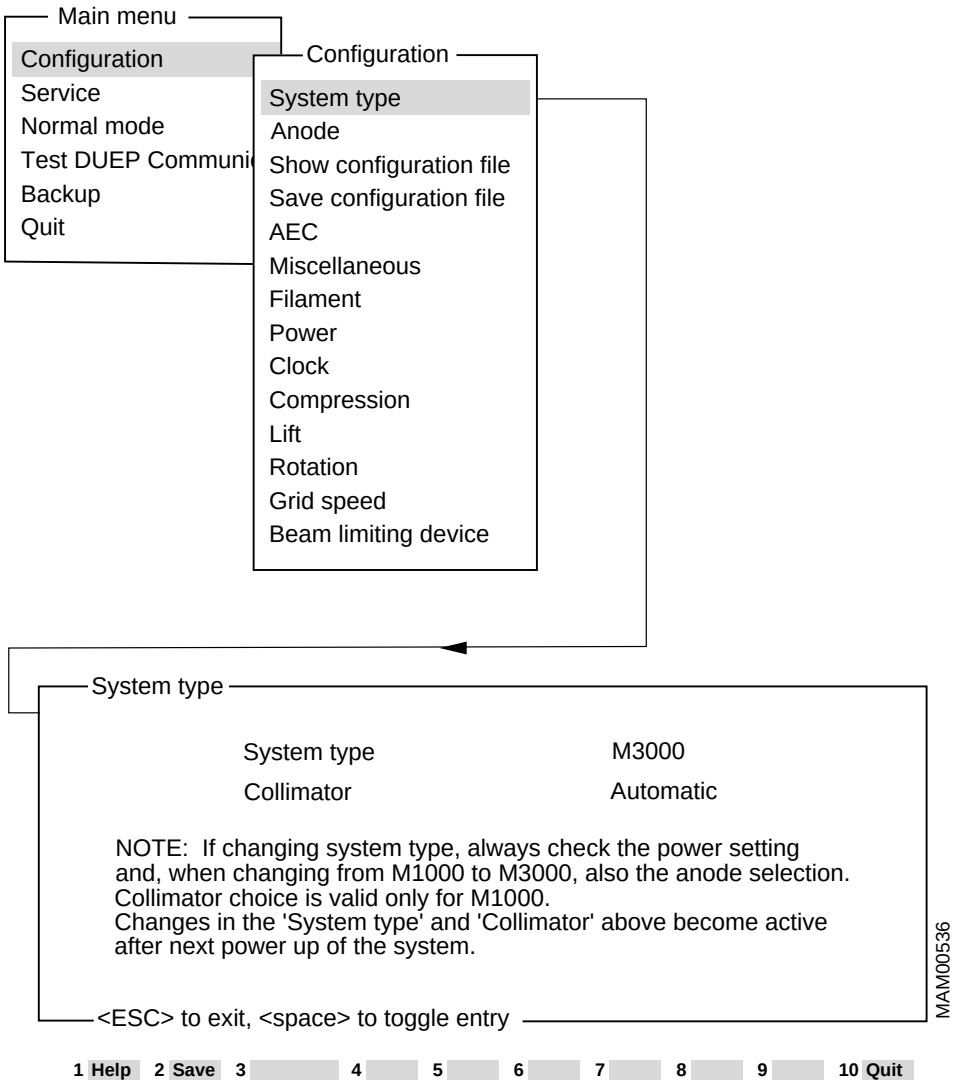


Fig. 1

System type indicates type of stand, generator and control panel. Collimator indicates type of collimator in the stand. Collimator choice (Automatic or Manual) is valid only for MAMMOMAT 1000.

When MAMMOMAT 1000 is selected, the tungsten anode is automatically deselected, and furthermore, the *Anode* menu cannot be selected.

Anode

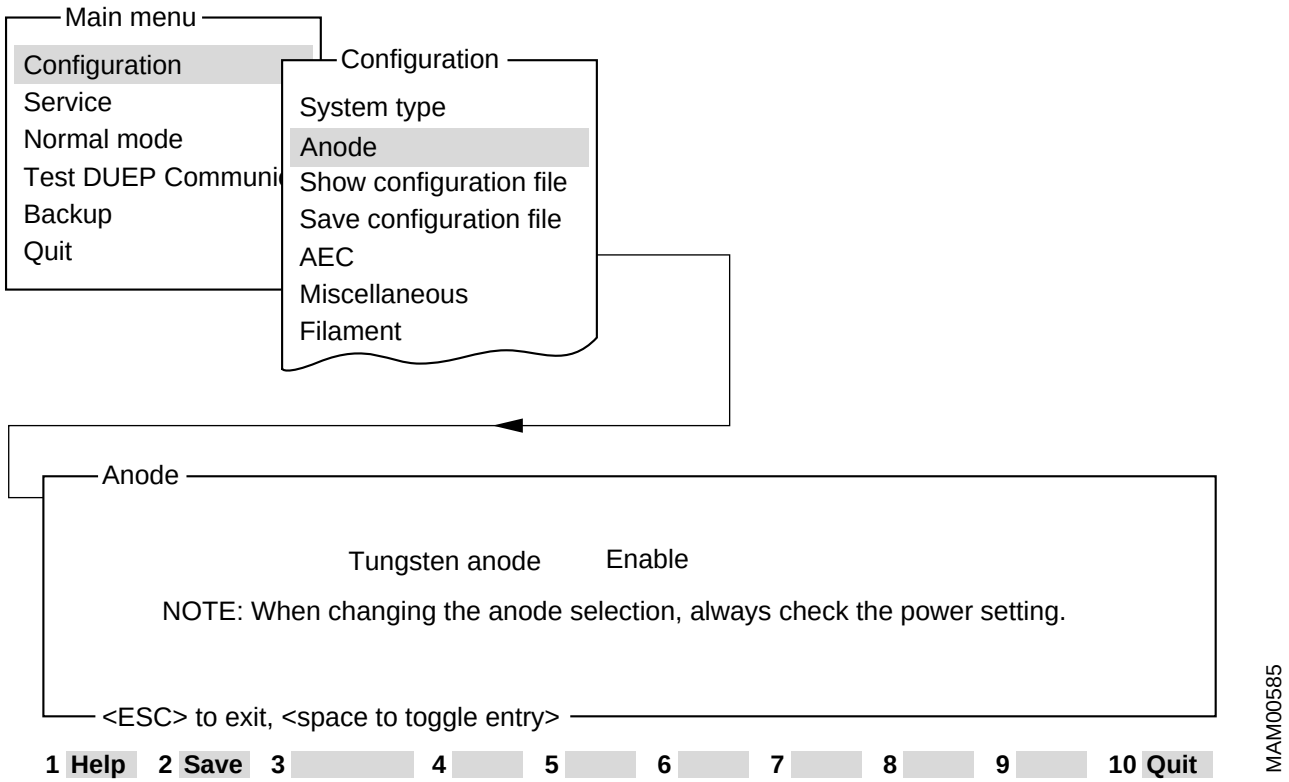


Fig. 2

Activation and deactivation of the tungsten anode. When deactivated, it will not be possible to select the W/Rh alternative on the control panel.

NOTE	**This menu is not selectable when the system type is set to M1000.**

Show configuration file

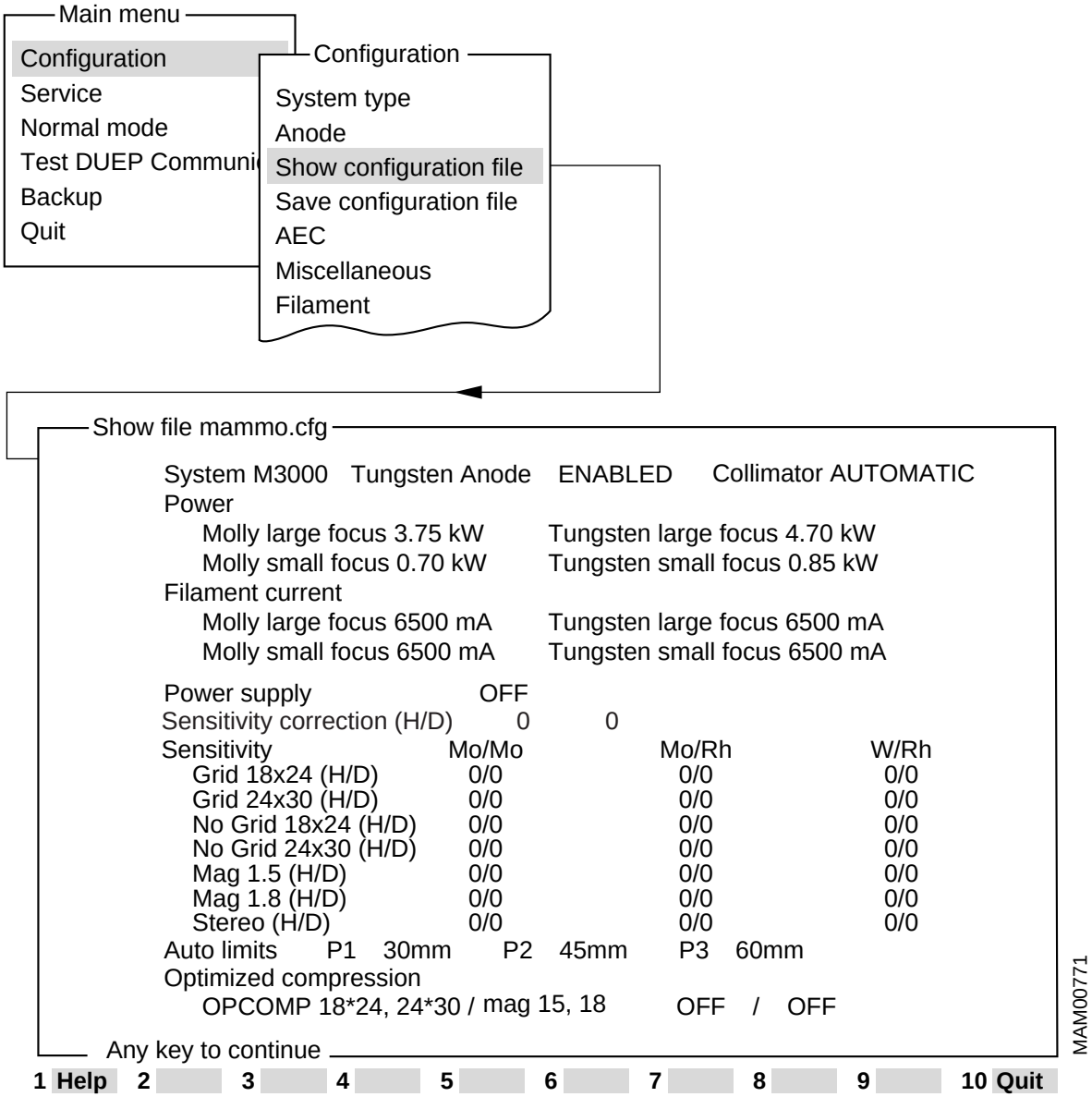


Fig. 3

This menu displays the system configuration as stored in the “mammo.cfg” file.

The file must be stored before it is possible to show it, see "Save configuration file" on Page 2 - 4.

NOTE	**All data are examples and may vary for the unit in question.**

Save configuration file

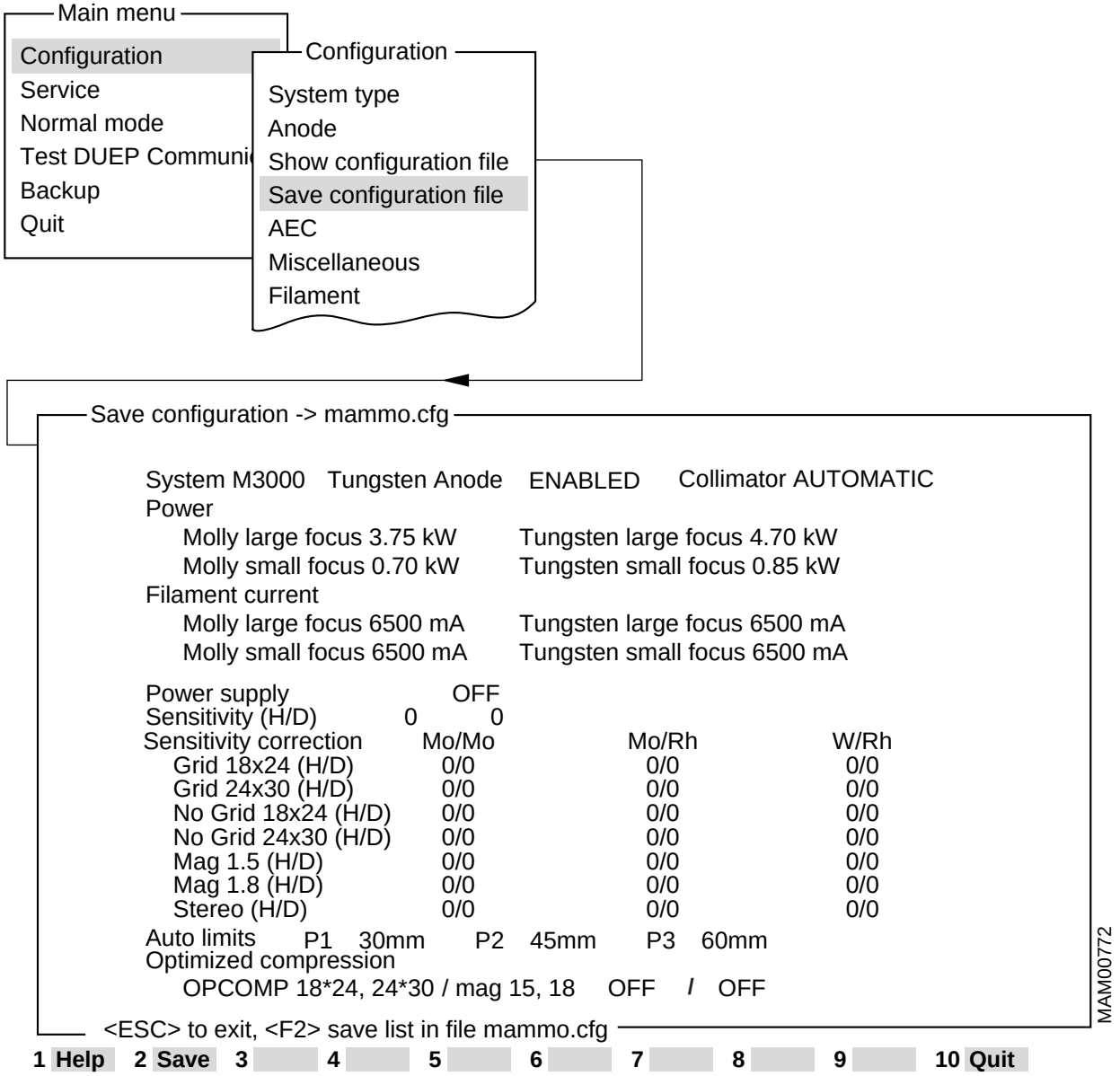

Main menu
Configuration
Service
Normal mode
Test DUEP Communi
Backup
Quit
Configuration
System type
Anode
Show configuration file
Save configuration file
AEC
Miscellaneous
Filament
Save configuration -> mammo.cfg
System M3000 Tungsten Anode ENABLED Collimator AUTOMATIC
Power
Molly large focus 3.75 kW Tungsten large focus 4.70 kW
Molly small focus 0.70 kW Tungsten small focus 0.85 kW
Filament current
Molly large focus 6500 mA Tungsten large focus 6500 mA
Molly small focus 6500 mA Tungsten small focus 6500 mA
Power supply OFF
Sensitivity (H/D) 0 0
Sensitivity correction Mo/Mo Mo/Rh W/Rh
Grid 18x24 (H/D) 0/0 0/0 0/0
Grid 24x30 (H/D) 0/0 0/0 0/0
No Grid 18x24 (H/D) 0/0 0/0 0/0
No Grid 24x30 (H/D) 0/0 0/0 0/0
Mag 1.5 (H/D) 0/0 0/0 0/0
Mag 1.8 (H/D) 0/0 0/0 0/0
Stereo (H/D) 0/0 0/0 0/0
Auto limits P1 30mm P2 45mm P3 60mm
Optimized compression
OPCOMP 18*24, 24*30 / mag 15, 18 OFF / OFF
<ESC> to exit, <F2> save list in file mammo.cfg
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00772

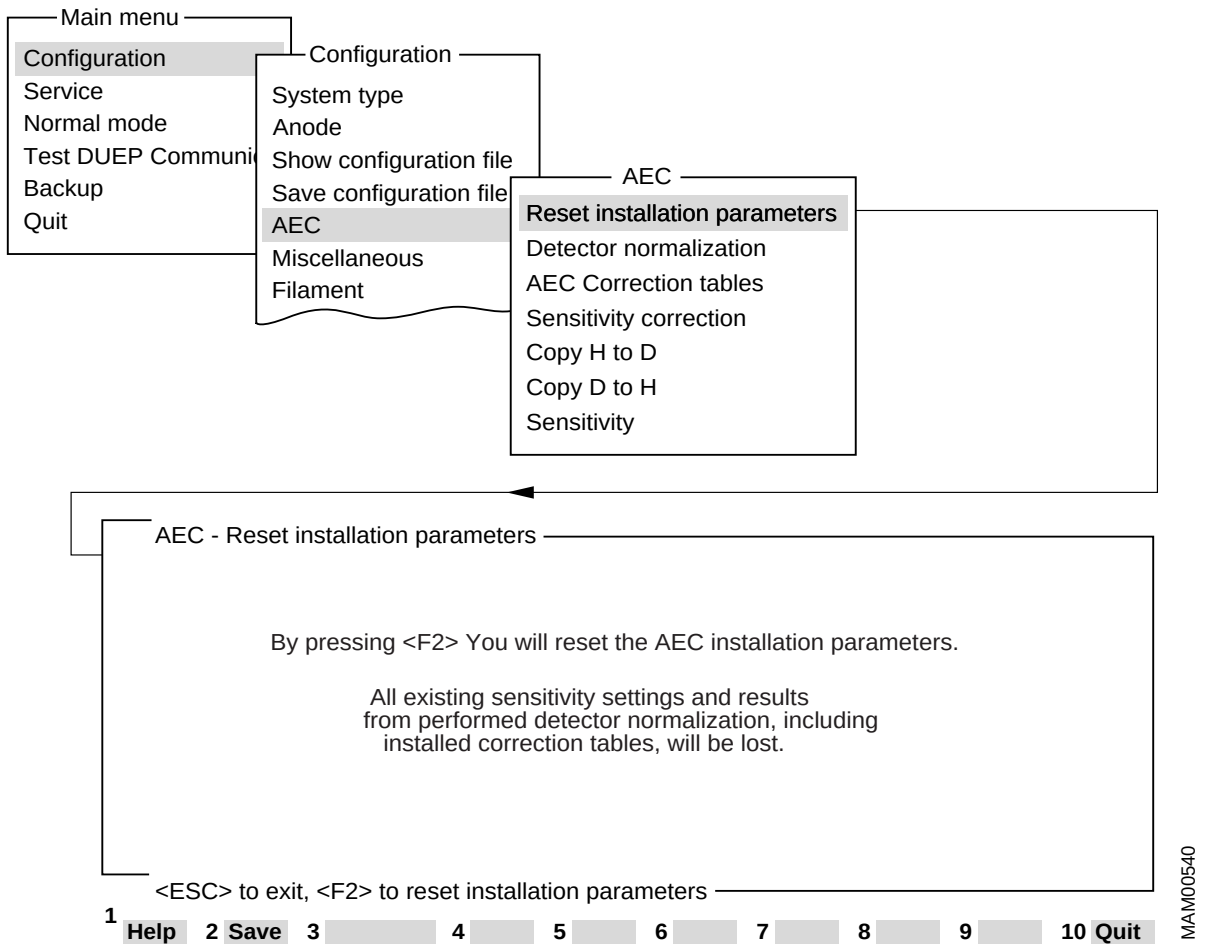
Fig. 4

This menu is used for storing information about the system configuration in the “mammo.cfg” file. Press <F2> to save the file.

If the service program was started from a floppy disk, the file will be stored on floppy. If the service program was started from the hard disk, the file will be stored on hard disk.

AEC

AEC -> Reset installation parameters



This menu is used for setting AEC installation parameters to default values and for erasure of installed AEC Correction tables in the MAMMOMAT.

NOTE	**It is not necessary to use this procedure with exchange of detector. It must be used with exchange of D701 if AEC backup is not available.**

AEC -> Detector normalization

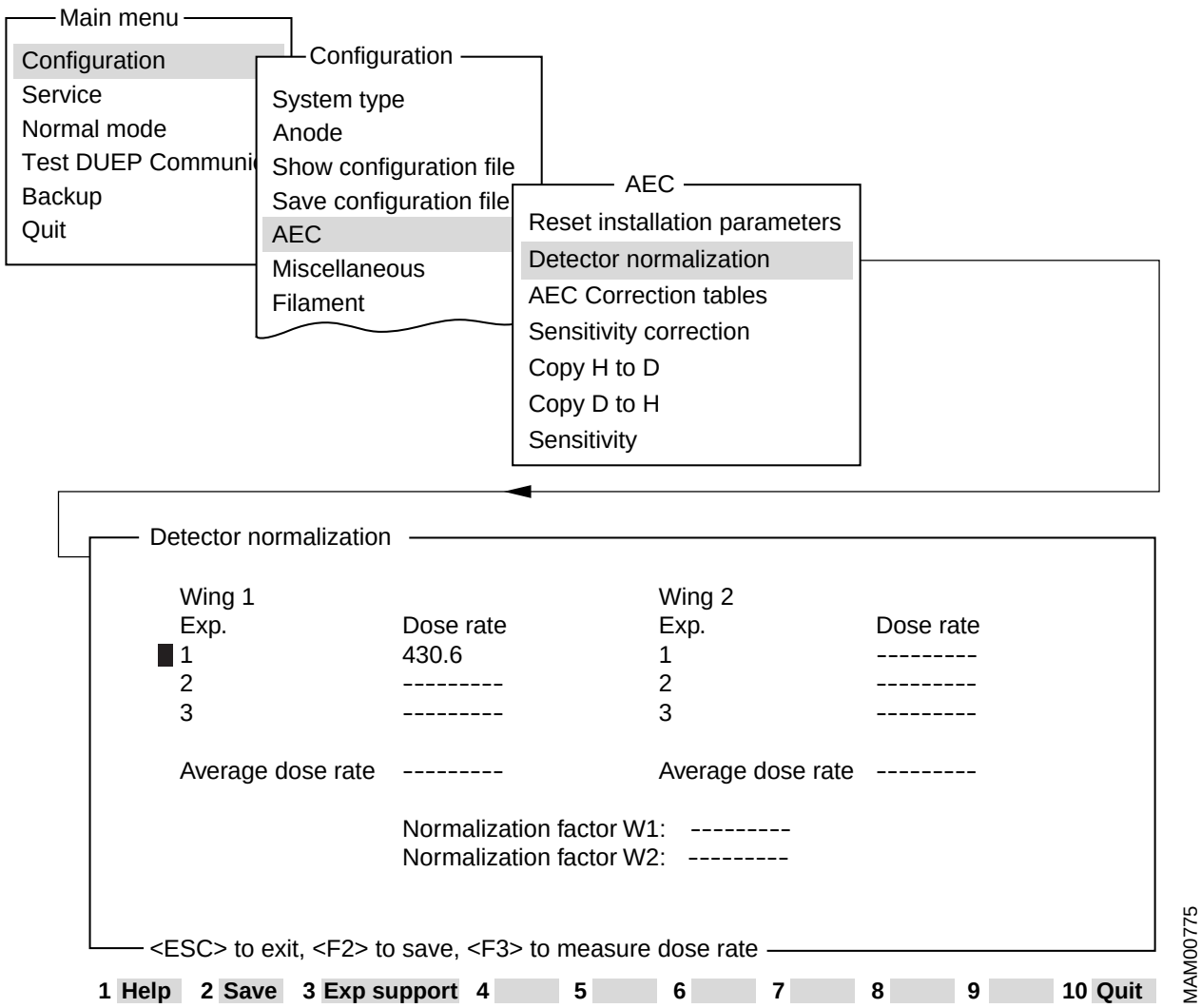


Fig. 5

This menu is used for normalization of the AEC detector in available wing. Values for Normalization factors are calculated and stored in the AEC.
Exposure results are stored in the result file “detnorm.txt” on the backup floppy.

NOTE	**All data are examples and may vary for the unit in question.**

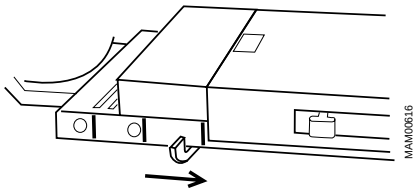
NOTE	**Wing 1 is not selectable when the system type is set to M1000.**

Perform detector normalization:

- after replacement of an AEC detector for that wing.
- after replacement of D701 and restoring from backup of AEC and correction tables. If two wing system, normalize both detectors.
- after AEC reset installation parameters. In a two wing M3000 normalize both detectors.

When performing detector normalizations:

- The detector is to be in chestwall position.



- The AEC calibration plexi (part no. 65 61 240) must extend at least 10 mm beyond the chestwall edge of the table and be centered.

The following exposures are to be made:

- with no cassette or film
- with the very same AEC calibration plexi and object table.

It is strongly suggested that you use a Grid 18x24 object table (Bucky).

1. Make sure a backup floppy is inserted.
2. In <Mainmenu> select <Configuration>, <AEC> and <Detector normalization>.

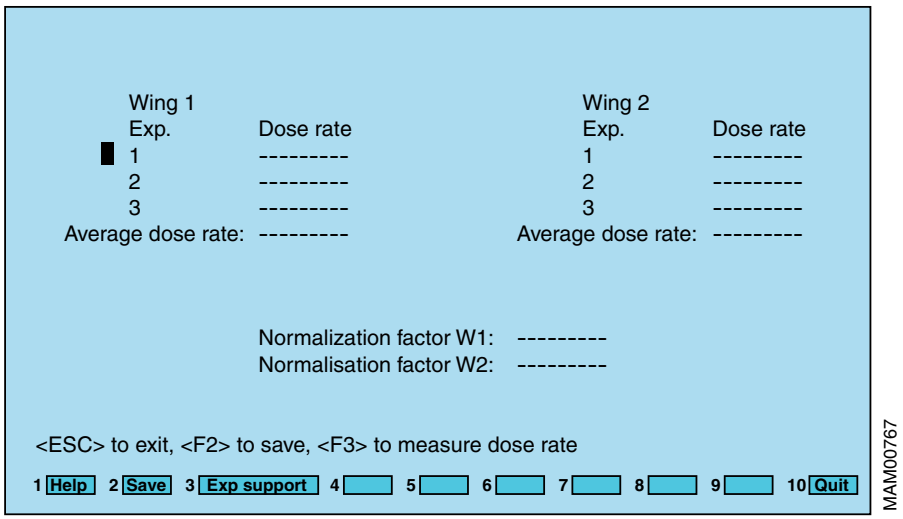
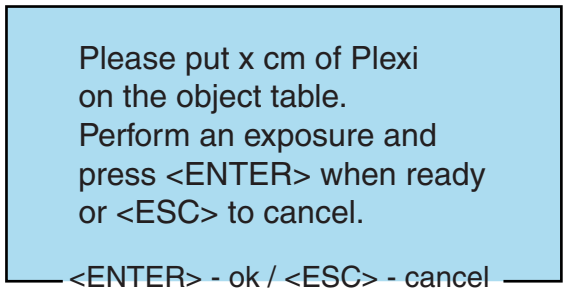


Fig. 6 Average dose rate: Out of the three obtained values, the one that differs the most is ignored. The average dose rate is then calculated based on the remaining two values. Normalization factor: The value of the normalization factor should be between 512 and 2048. If not, ensure that the correct object table and AEC calibration plexi have been

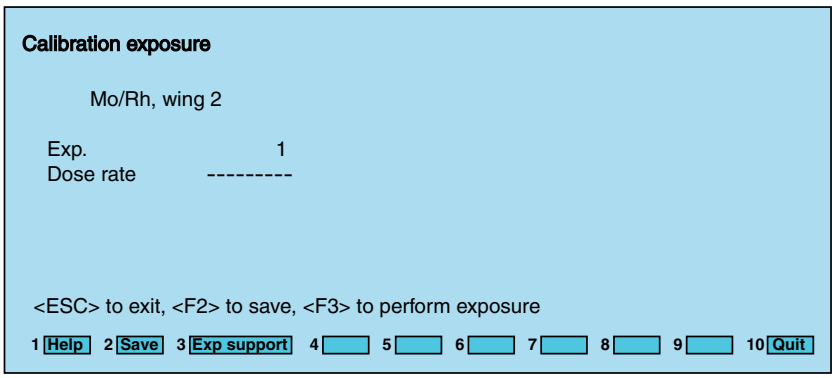
3. Bring the detector to be normalized into the x-ray field.

4. Place the cursor by one of the exposures of the wing in use and press <F3> to start the exposure procedure.



5. Follow the instructions in the message box.

6. After pressing <ENTER> the dialog *Calibration exposure* appears. The Dose rate should now have a value. Save the value with <F2>.


Calibration exposure
Mo/Rh, wing 2
Exp. 1
Dose rate ---------
<ESC> to exit, <F2> to save, <F3> to perform exposure
1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit
MAM00769

7. Repeat steps 4 to 6 for the other two exposures, for the wing in question.

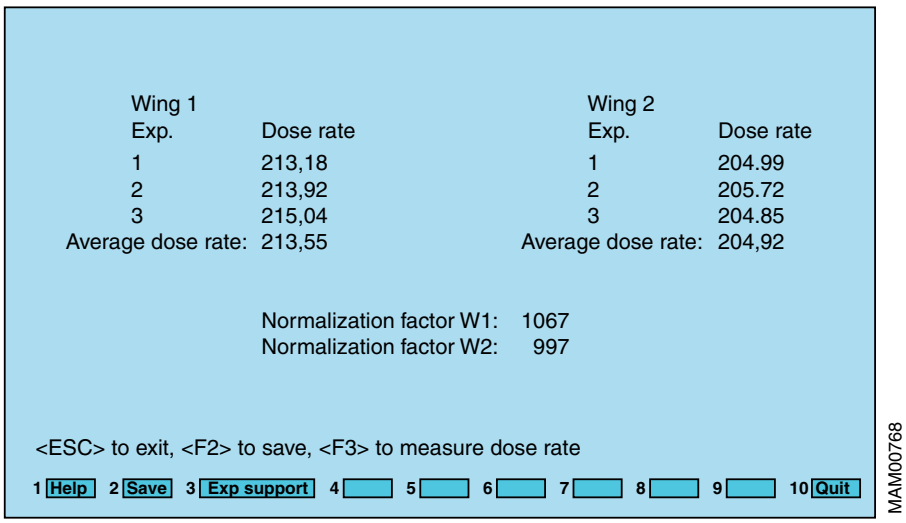


Fig. 7 Example of the final result of a wing calibration

8. If only one detector is to be normalized, save the values by pressing <F2>. Otherwise proceed to steps number 9 and 10.

9. Bring the other wing into the x-ray field. Use the same object table.

10. Repeat steps 4 to 6 for the other three exposures. Save the values on floppy by pressing <F2>.

AEC -> Correction tables

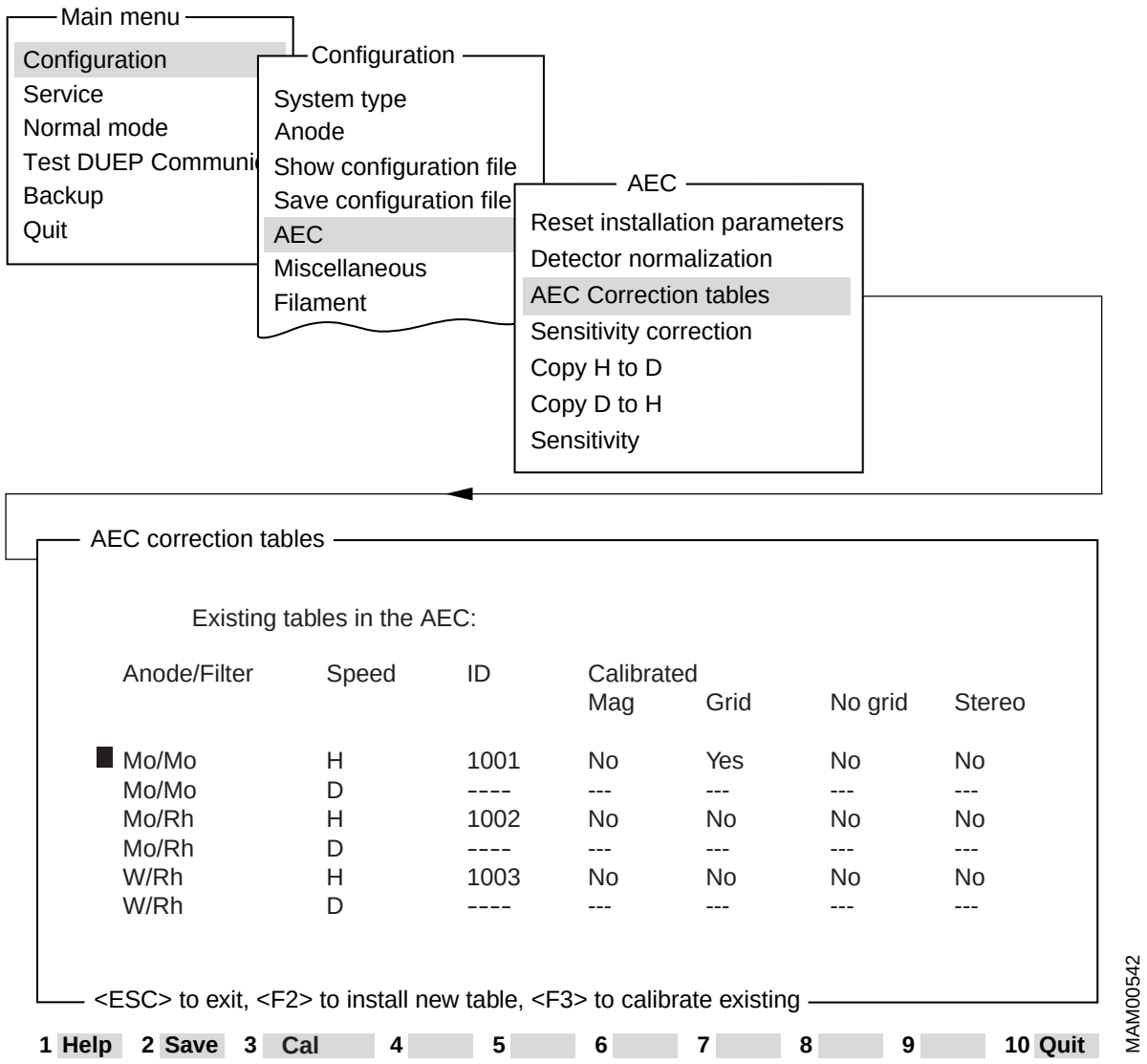


Fig. 8

This menu is used for:

- Installation of correction tables (F2).
- Calibration of correction tables (F3), including rough setting of sensitivity correction.

The AEC uses one correction table for each Anode/Filter/Speed combination. Each correction table has separate corrections for each object table group (Magnification, Grid, No grid and Stereo). When pressing <F2> a dialog box will appear, in which the ID of the correction table to be installed (from floppy disk) should be entered. When the transaction of the correction table to the AEC is finished, the program will automatically go on to the calibration process.

To enter the calibration process without having installed new correction tables, press <F3>. When pressing <F3> correction tables previously installed will be loaded from the AEC. See “Installation and Start-Up Instructions” for further information.

During the calibration process of a correction table calibration reference data is fetched from a calibration file (“calxxxx.txt”, in which the four x:es represent the ID number). The ID of this file is the same as for the correction table in use and is located on the floppy containing the AEC correction tables (original AEC correction tables shall normally be copied from the floppy "AEC correction tables" to a backup floppy). The backup floppy must be inserted during the entire calibration.

When pressing <F2> exposure data from the calibration process is stored in a result file, e.g. “mrgh.txt”, on this floppy. In “mrgh.txt” the first letter represents type of anode (“m” for molly or “w” for wolfram/tungsten), the second represents type of filter (“m” for molly or “r” for rhodium), the third represents the kind of object table (“g” for grid, “n” for no grid, “s” for stereo or “m” for magnification) and the fourth represents the speed (“h” for high or “d” for detailed).

AEC -> Sensitivity correction

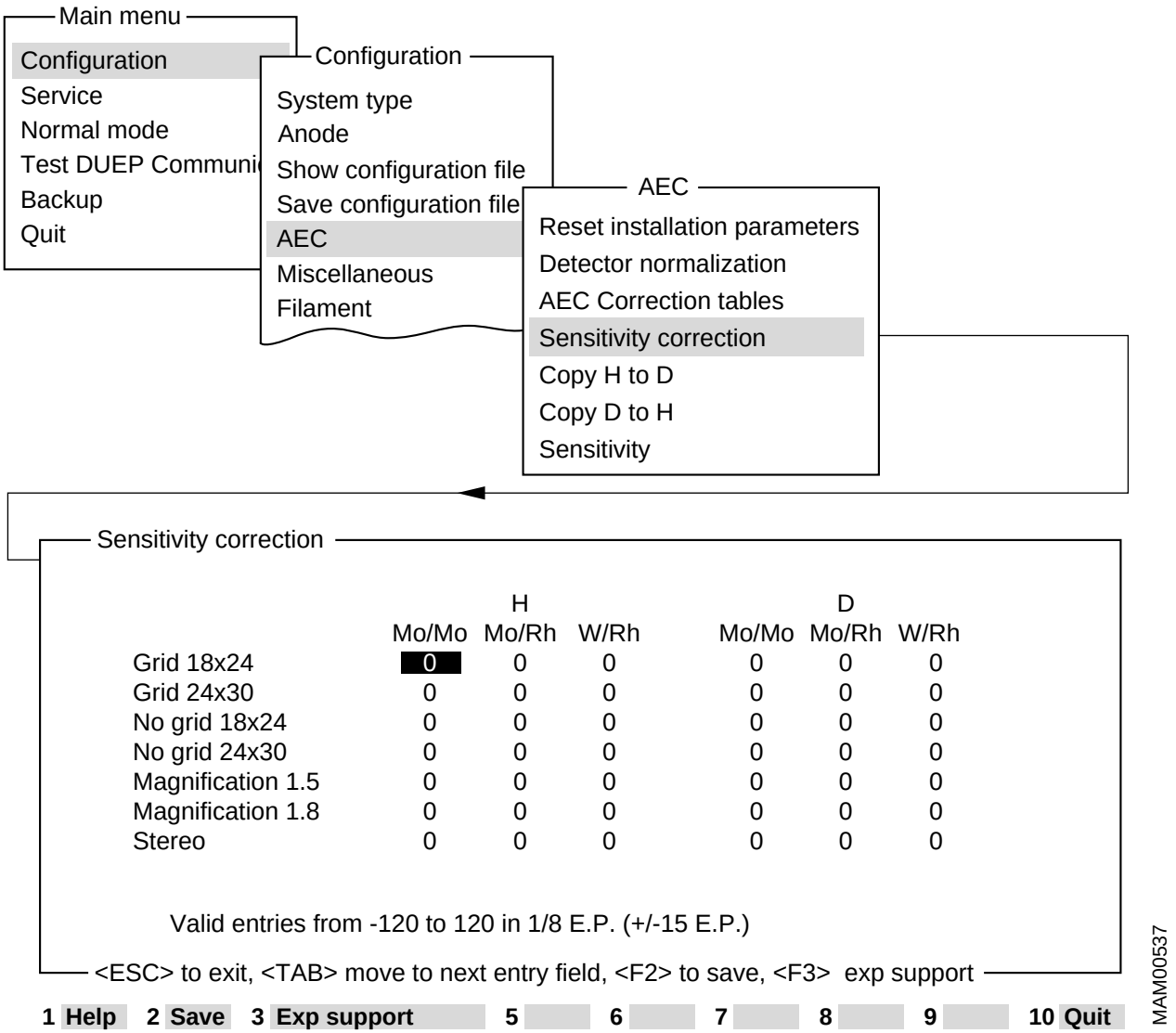


Fig. 9

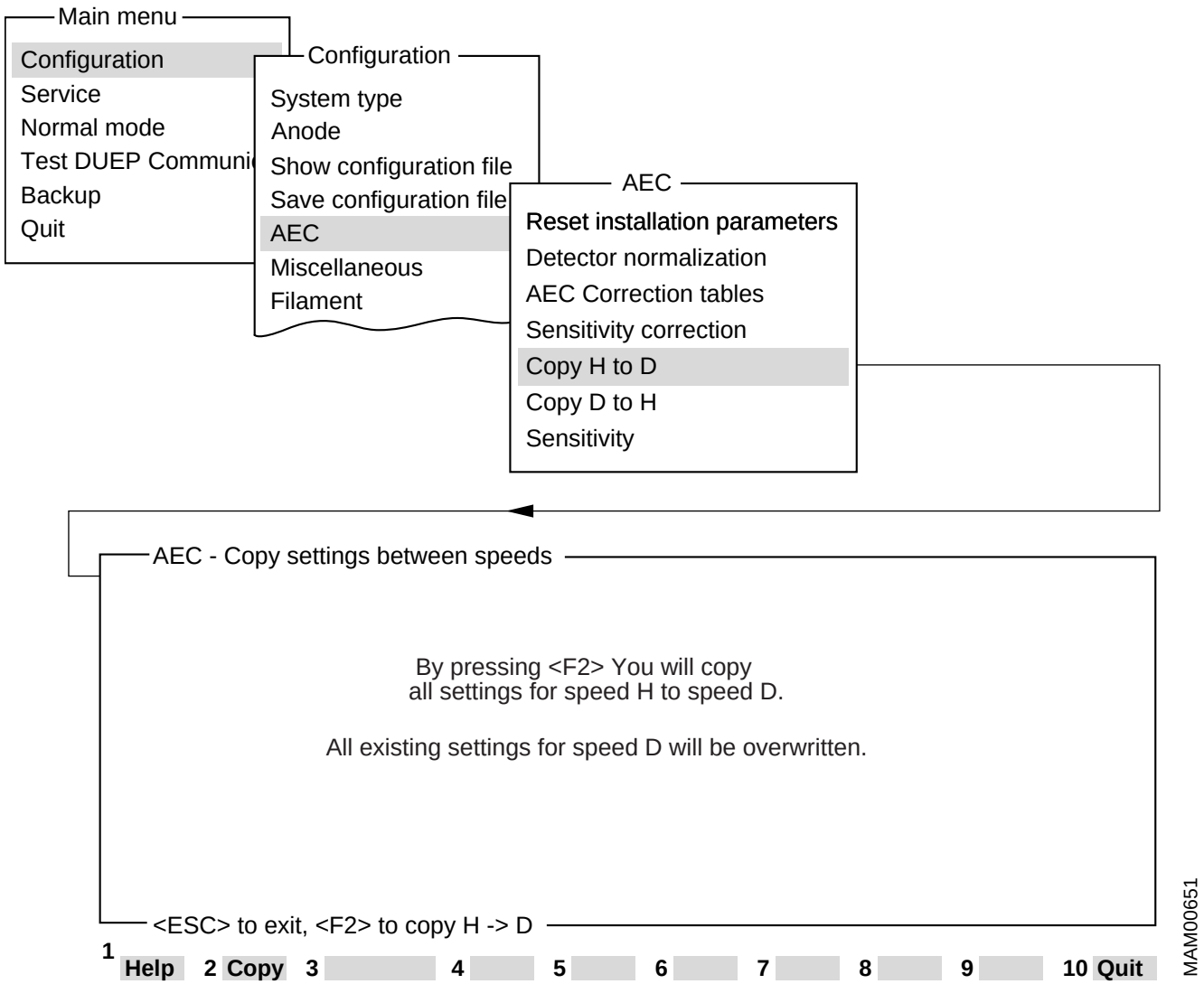
This menu is used for setting the sensitivity correction of the AEC channel for all object table types, combinations of anode/filter and for speed H and D respectively.

By pressing <F3> the correct exposure parameters will be set for the generator and a message box appears, showing which Plexiglas thickness should be used during exposure. A floppy containing the AEC correction tables must be inserted since access to the calibration file (“calxxxx.txt”) is necessary when using the function <F3> exp support.

Values from -120 to 120 can be entered in 1/8 exposure points.

Also see “Installation and Start-Up Instructions”.

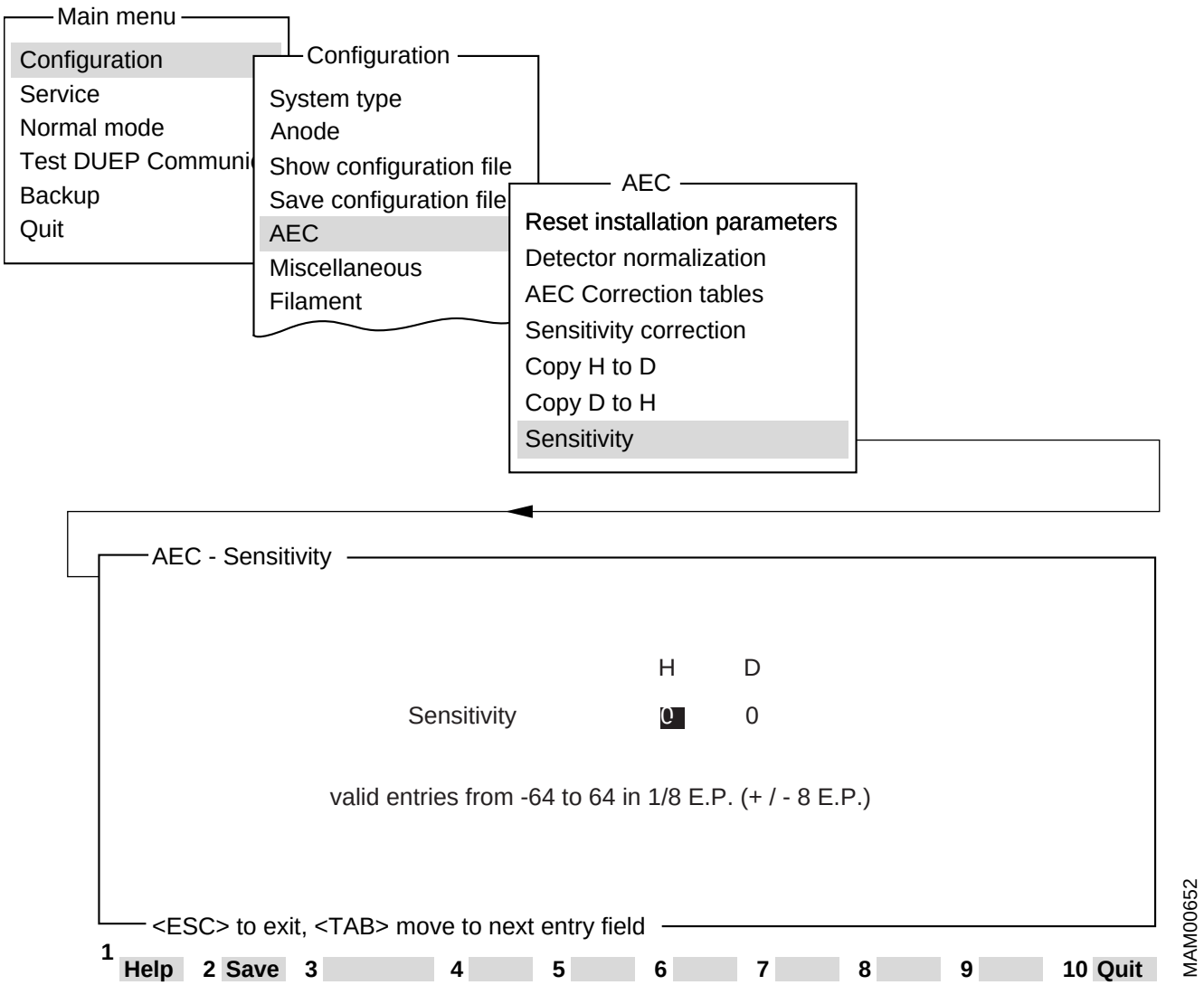
AEC -> Copy H to D



This menu is used for copying AEC data from speed H to speed D.

NOTE	**Alternative Copy D to H works similarly to Copy H to D.**

AEC -> Sensitivity



This dialog indicates the sensitivity of the AEC for speed H and speed D respectively.

Values from -64 to 64 can be entered in 1/8 exposure points.

NOTE	**If only one type of film-screen-combination is used, set both values for H and D to the same level.**

Also see “Installation and Start-Up Instructions”.

Miscellaneous

Miscellaneous -> DLF switch

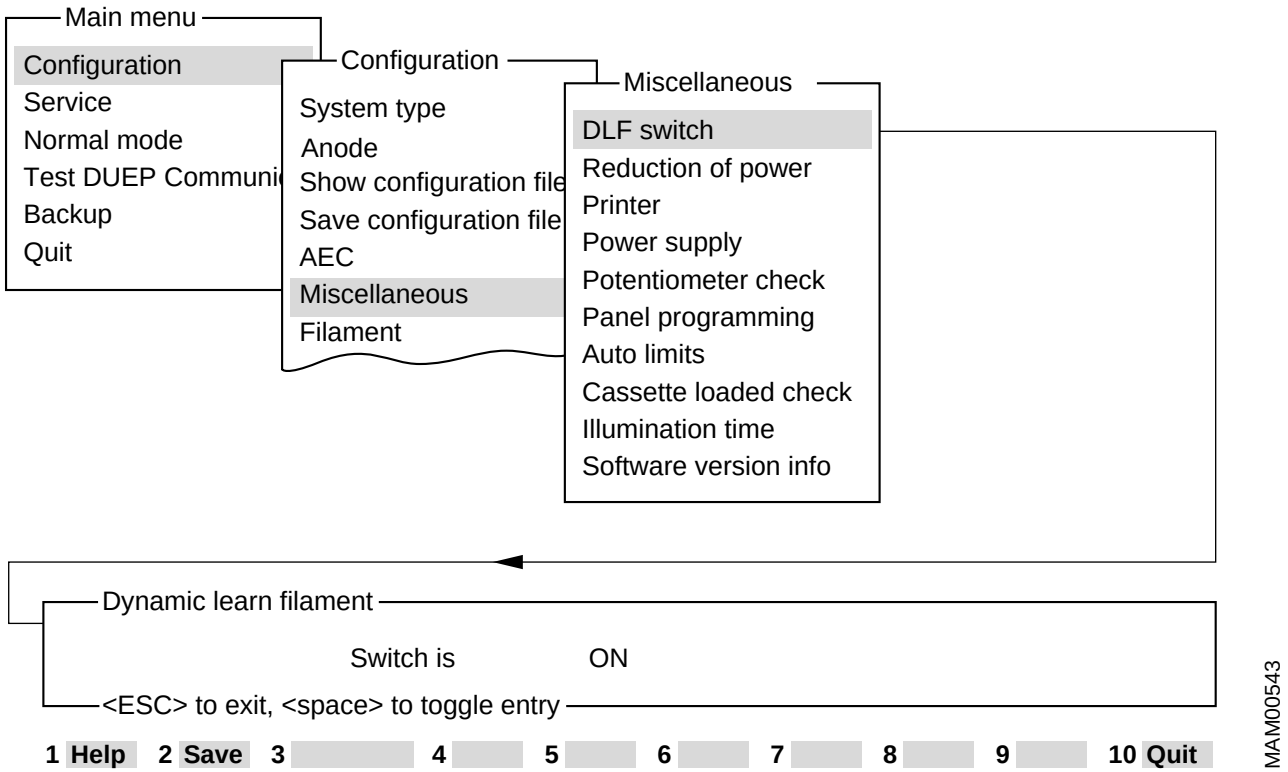


Fig. 10

Activation and deactivation of the filament current adaptation. When activated, the adaptation takes place after a total of ten exposures has been made with the actual focus, if the deviation of the average value from the nominal value is not within -15% to + 5%.

NOTE	**Without any exceptional reason, the DLF-switch shall be “ON”.**

Miscellaneous -> Reduction of power

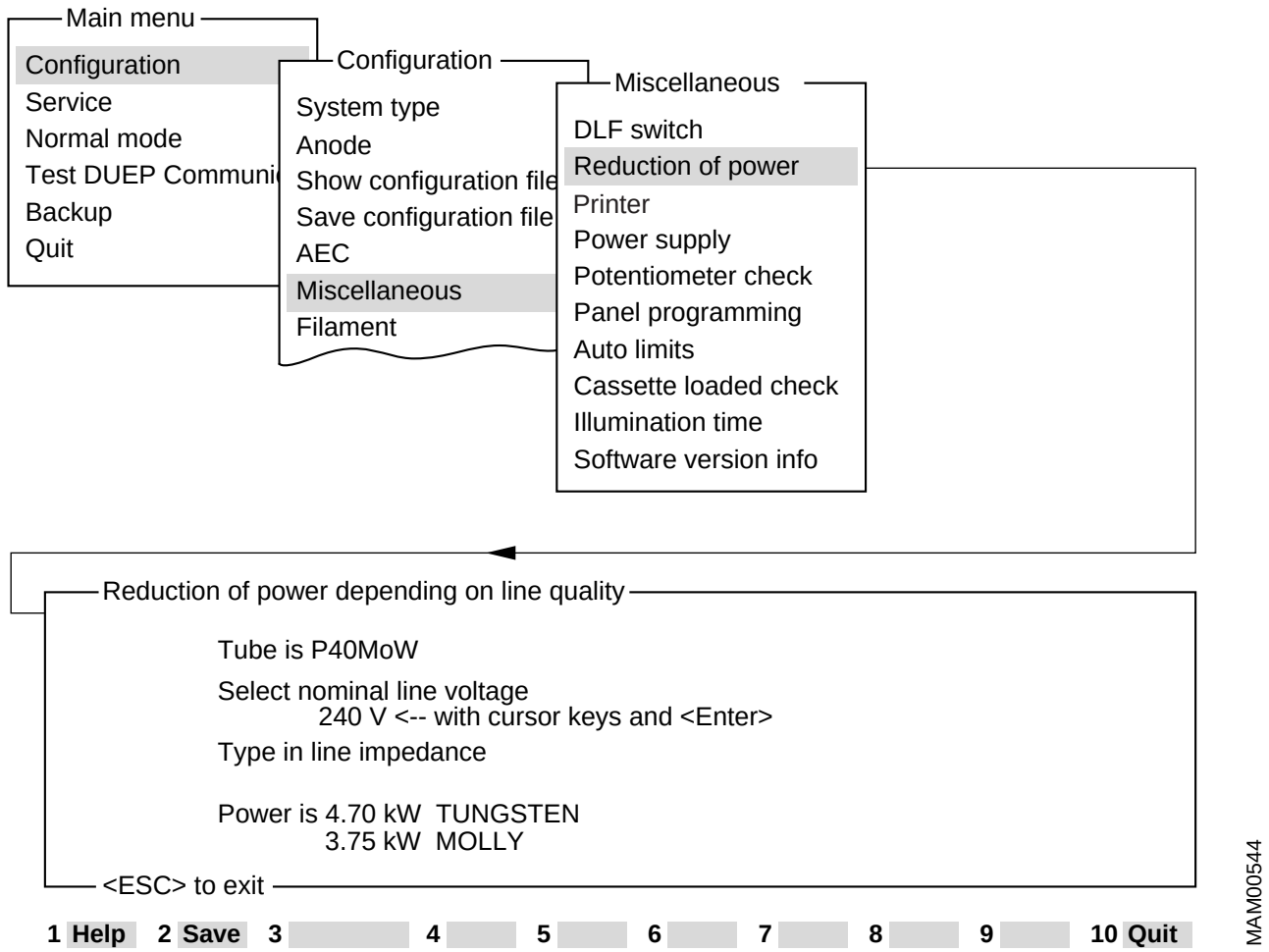


Fig. 11

Calculates the maximum power allowed with regard to nominal voltage and line impedance.

Select the line voltage and type in the line impedance you have measured. The processor will calculate the power and will indicate when the power must be reduced because of the line impedance.

Finally press <F2> to save.

Miscellaneous -> Printer

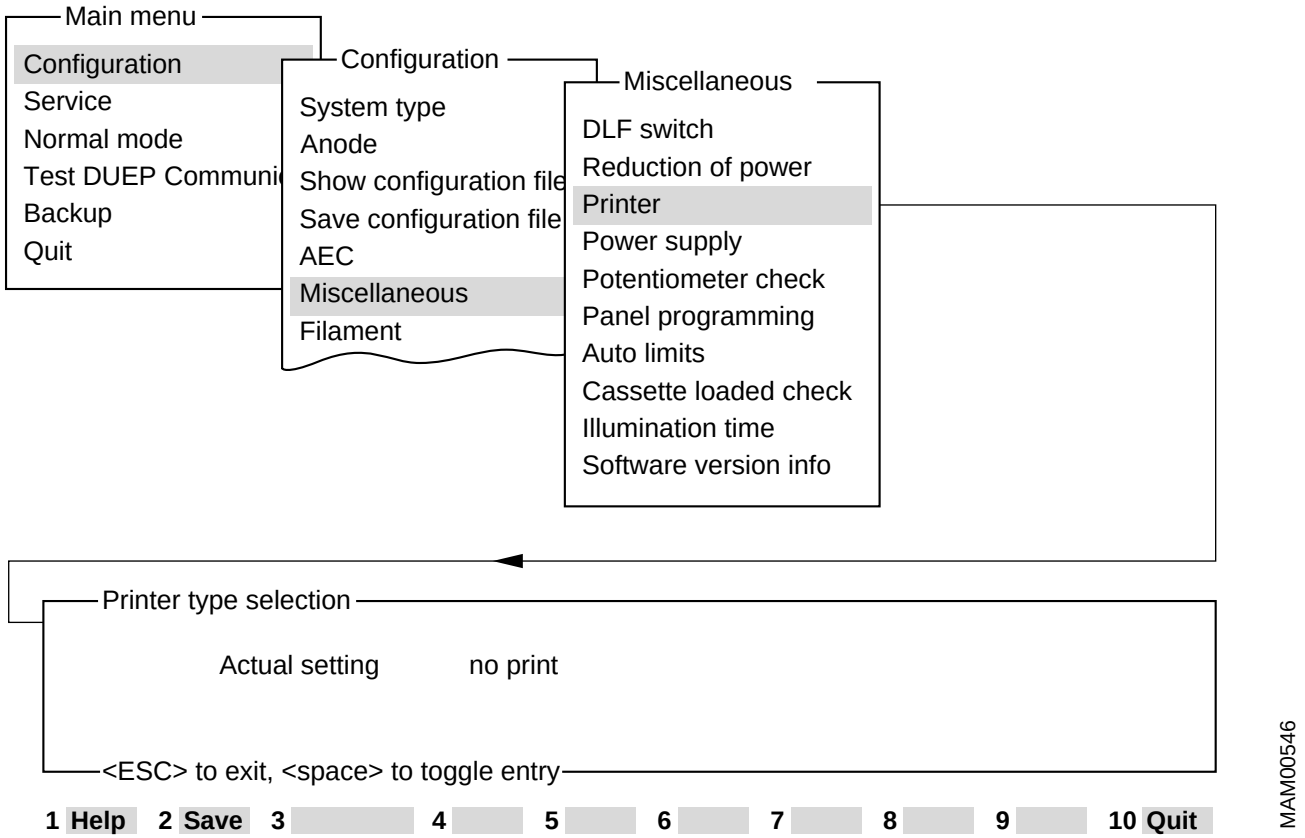


Fig. 12

Select no print, RS 232C or PC print.

RS 232C is used when the printer is connected directly to the generator.

PC print is used when the printer is connected to the system via a PC that is connected to the generator.

Miscellaneous -> Power supply

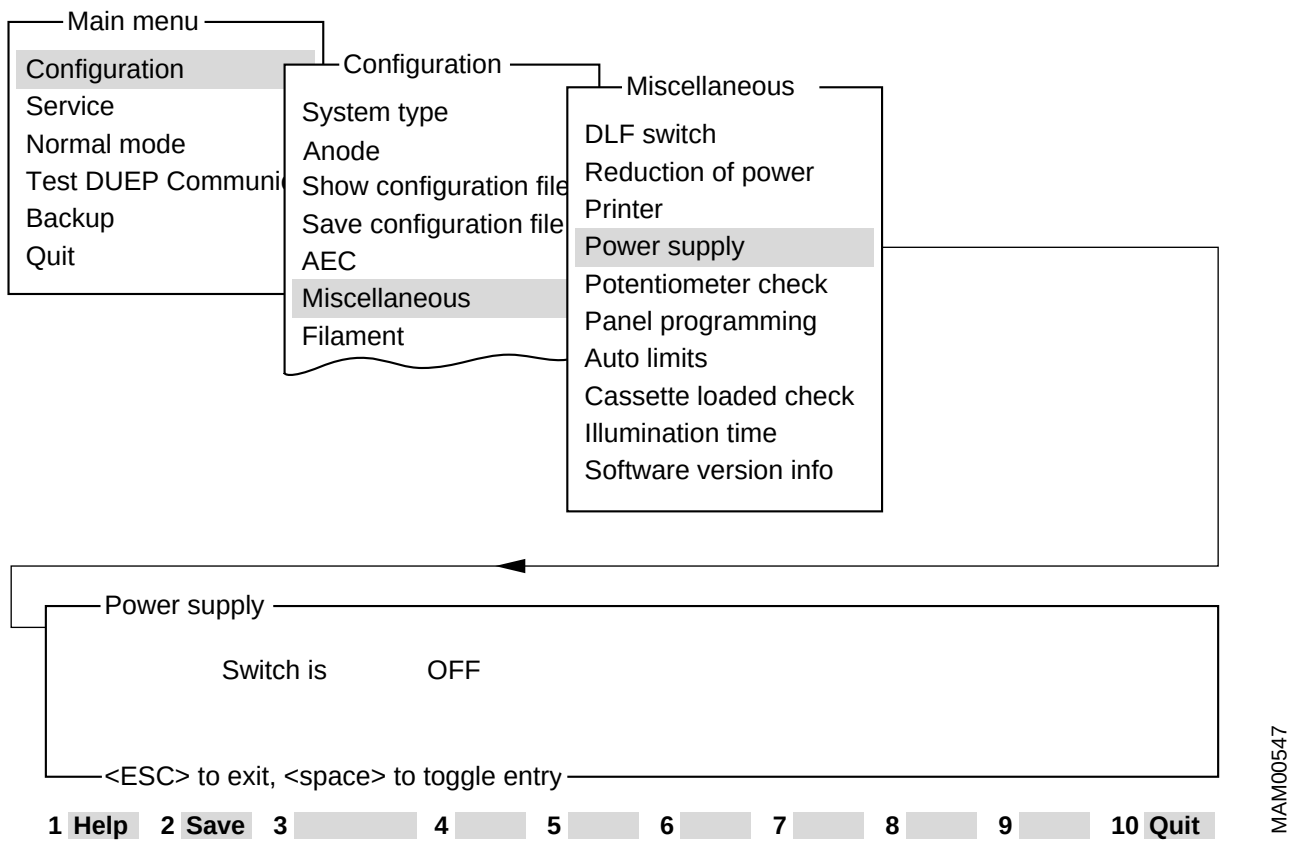


Fig. 13

Indicates whether the MAMMOMAT is powered by an external power supply (e.g. Power Aid) or not.

Miscellaneous -> Potentiometer check

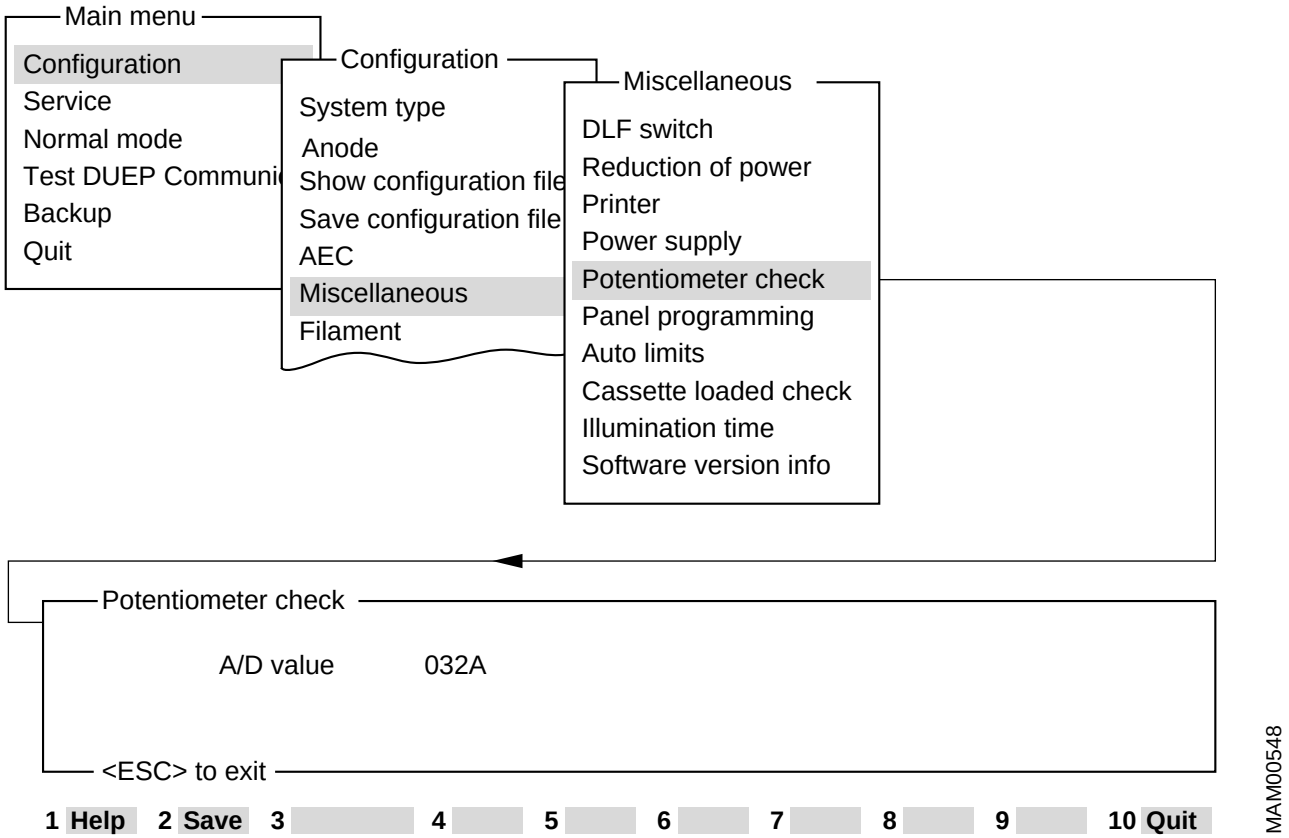


Fig. 14

Sampled calibration value for the return current through the four potentiometers “preset force”, “preset angle”, “thickness” and “angle”. This return current is continuously monitored by the system. Should the return current deviate too much from the calibration value, this is probably due to a faulty potentiometer or due to a contact failure with one of the potentiometers, which results in error code 825 or 826.

Miscellaneous -> Panel programming

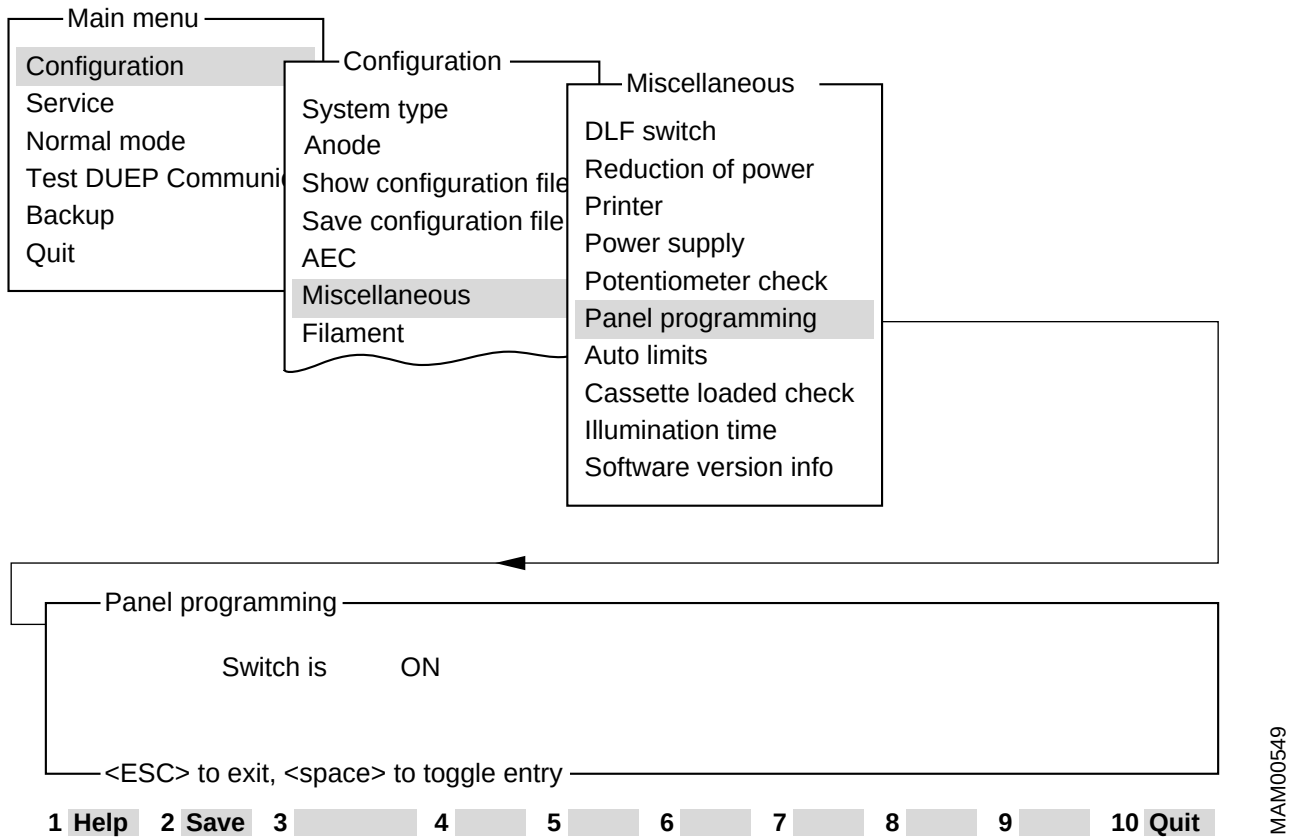


Fig. 15

Activation and deactivation of the Memory button on the control panel, making it possible to change the program settings for the four programs.

With the switch “OFF”, any change of data is blocked.

NOTE	**Should be switched “OFF” only if customer demands.**

NOTE	**This menu is not selectable with software V4.1 when the system type is set to M1000.**

Miscellaneous -> Auto limits

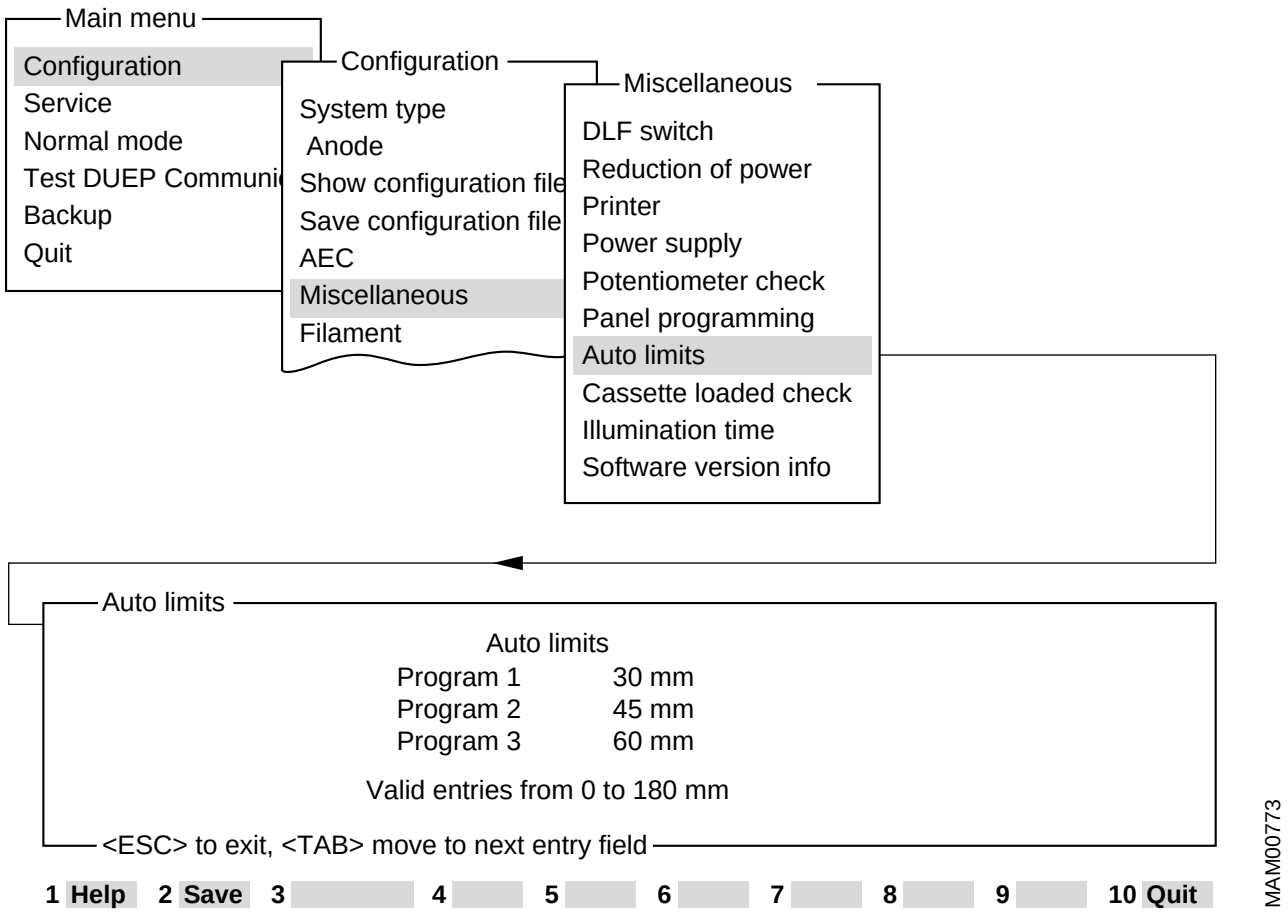


Fig. 16

Set the upper thickness limits for the programs 1-3.

Program 1 has a lower limit of 0 and Program 4 has a higher limit of 180 mm.

Supposing the above used values are stored in auto mode:

- The program key P1 is automatically selected with a compression thickness between 0 and 30 mm.
- The program key P2 is automatically selected with a compression thickness between 31 and 45 mm.
- The program key P3 is automatically selected with a compression thickness between 46 and 60 mm.
- The program key P4 is automatically selected with a compression thickness more than 60 mm.

NOTE	**This menu is not selectable with software V4.1 when the system type is set to M1000.**

Miscellaneous -> Cassette loaded check

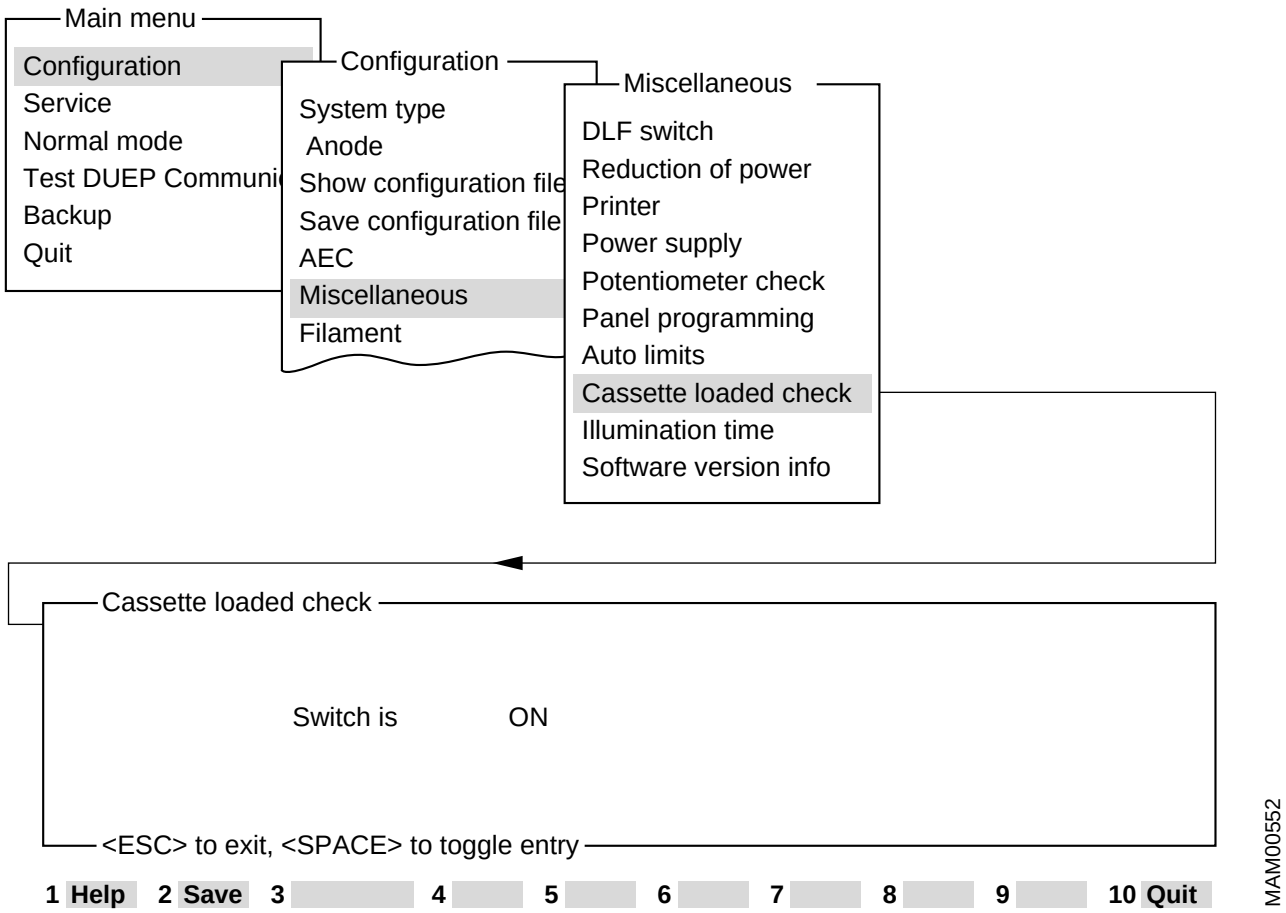


Fig. 17

Activate or deactivate the check that a cassette is loaded/reloaded.

With this function activated, the cassette symbol on the control panel will light up when the inserted cassette has been exposed or if no cassette is inserted at all. Exposure release is in this case blocked. The film cassette must be exchanged after each exposure.

During service it might be helpful to set the switch to “OFF”. When finishing service, do not forget to set it back to the original setting.

Miscellaneous -> Illumination time

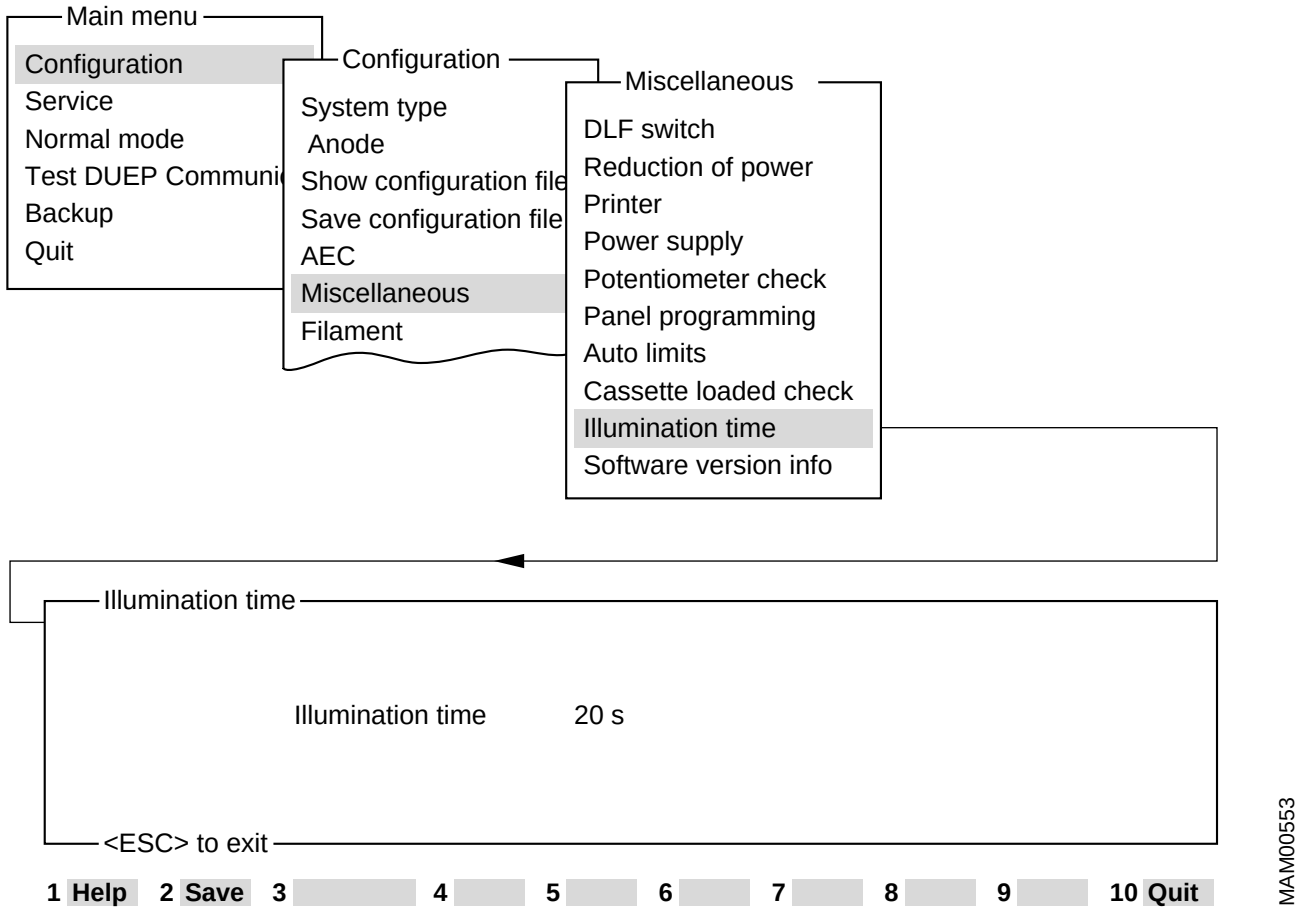


Fig. 18

Duration of switched-on field light (collimator lamp), 1-99 s.

Set the duration according to customer's wishes.

Miscellaneous -> Software version info

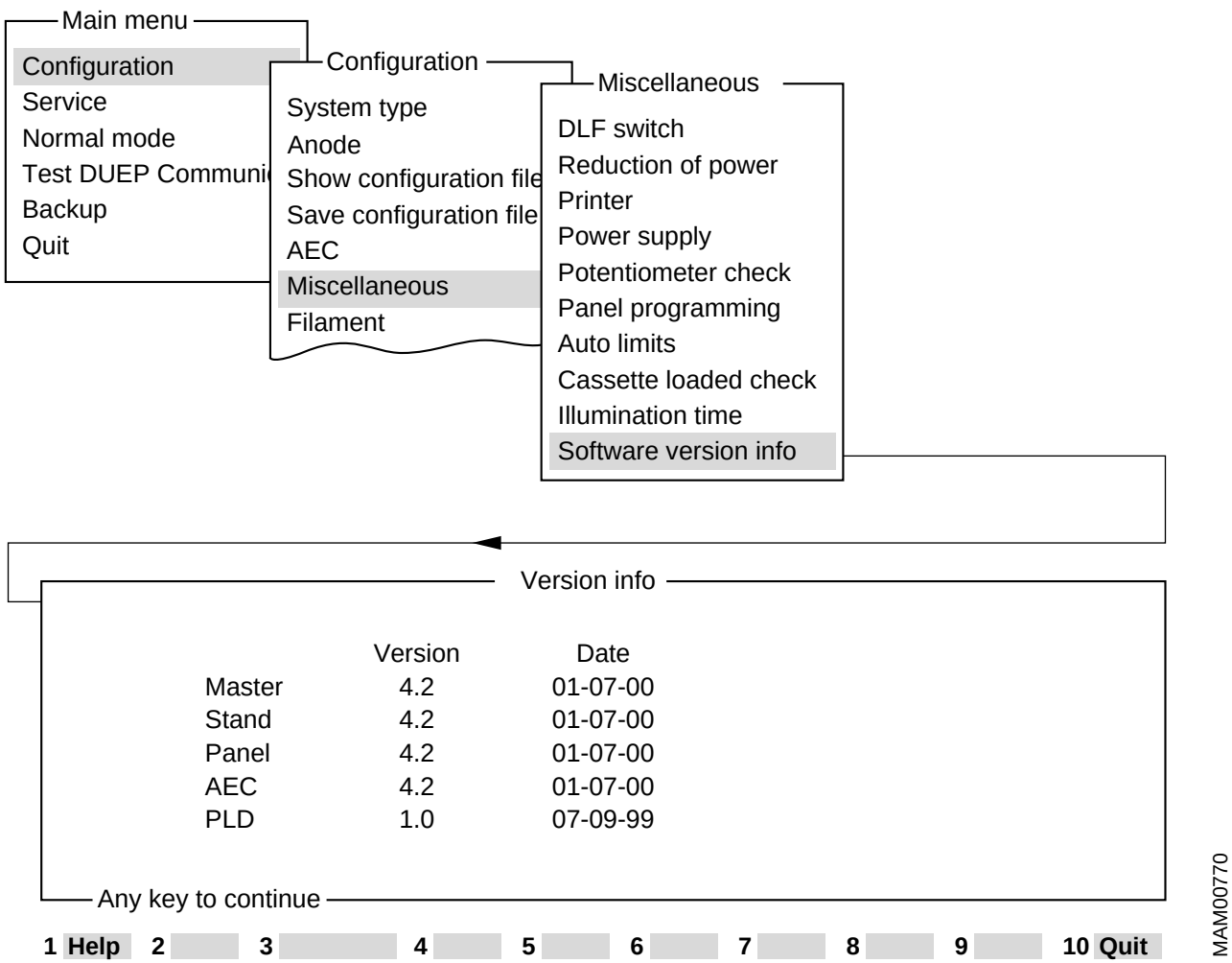


Fig. 19

Shows software versions (and their release dates) used in the system.

Filament

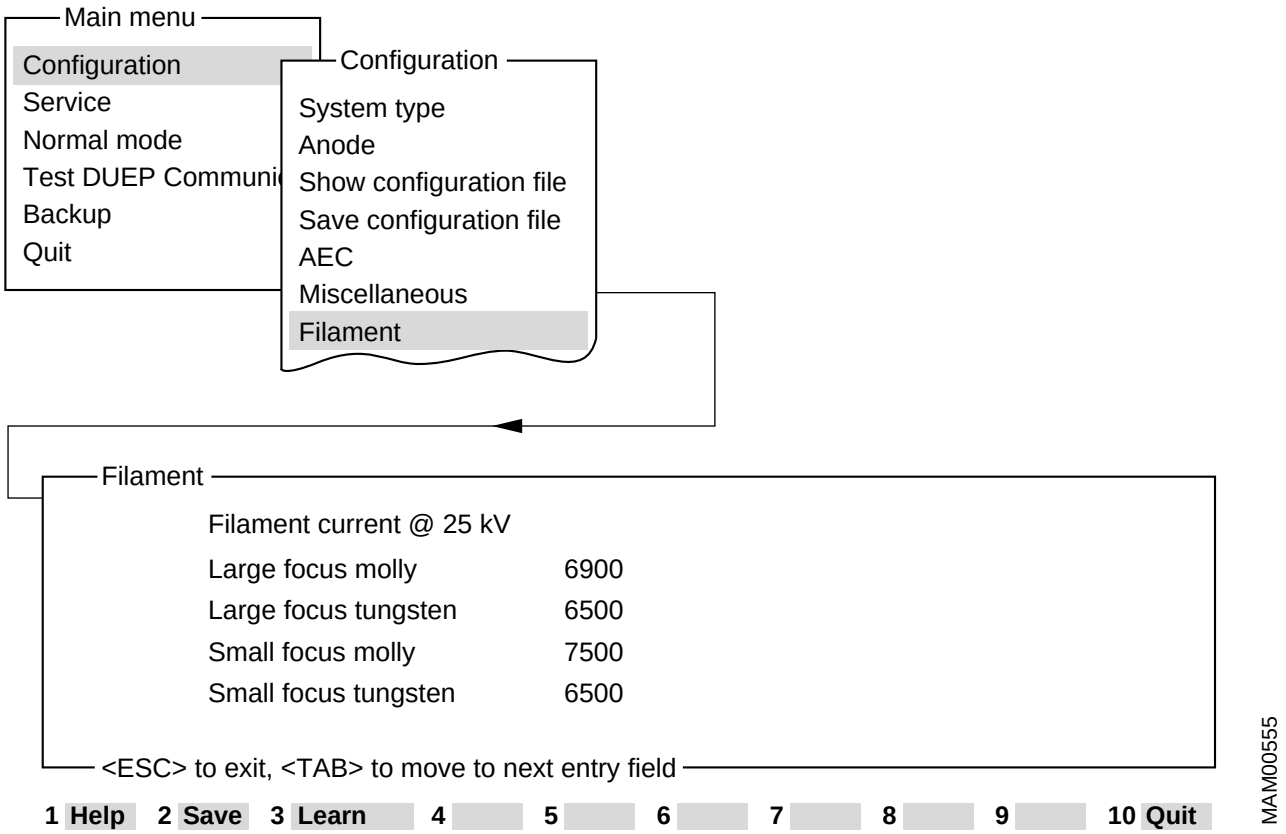


Fig. 20

Indicates the adapted filament current of available anode materials for large and small focus.

Adaptation exposures for the filament current are also made in this menu.

Pressing F3 sets the exposure parameters on the control panel, and subsequently pressing Alt-F6 starts the exposure. Repeat this procedure until the tube-current deviation is within ±5%.

If the tube has been replaced, program the filament current value 200 mA lower than the value stated in the test certificate as a pre adjustment. (e.g. If tube value is 6900, program 6700.)

If a new filament current has been entered you must save the new value (press F2) before the learn filament is performed.

NOTE	**The Dynamic-Learn-Filament may change this adjustment. But the DLF will only learn when the exposure time is longer than 60 ms.**

Power

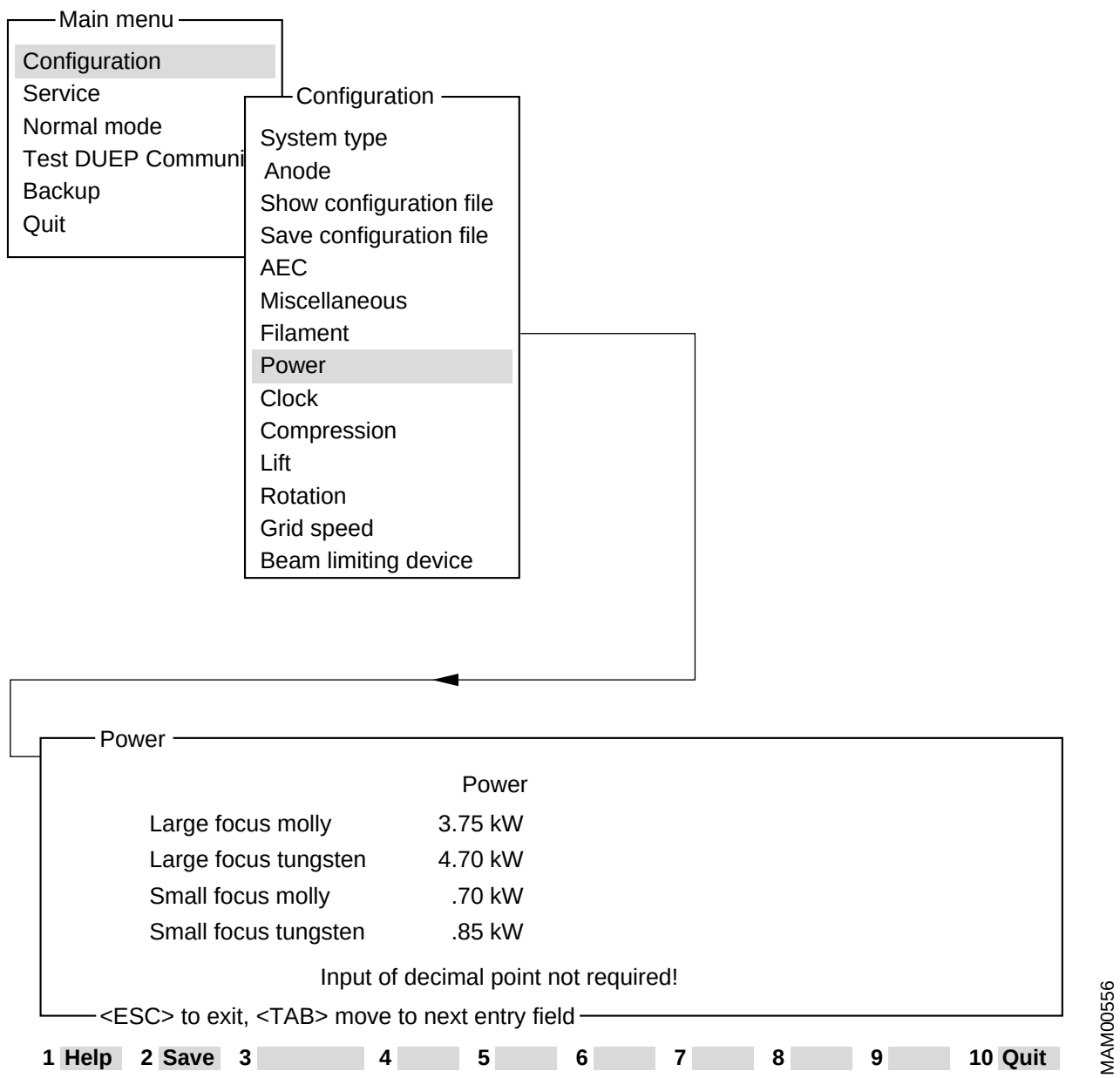


Fig. 21

Indicates the maximum power for large and small focus of available anode materials. The values programmed must not exceed the values stated above.

The maximum power depends on the measured line impedance. (See Installation and Start-Up Instructions.)

Clock

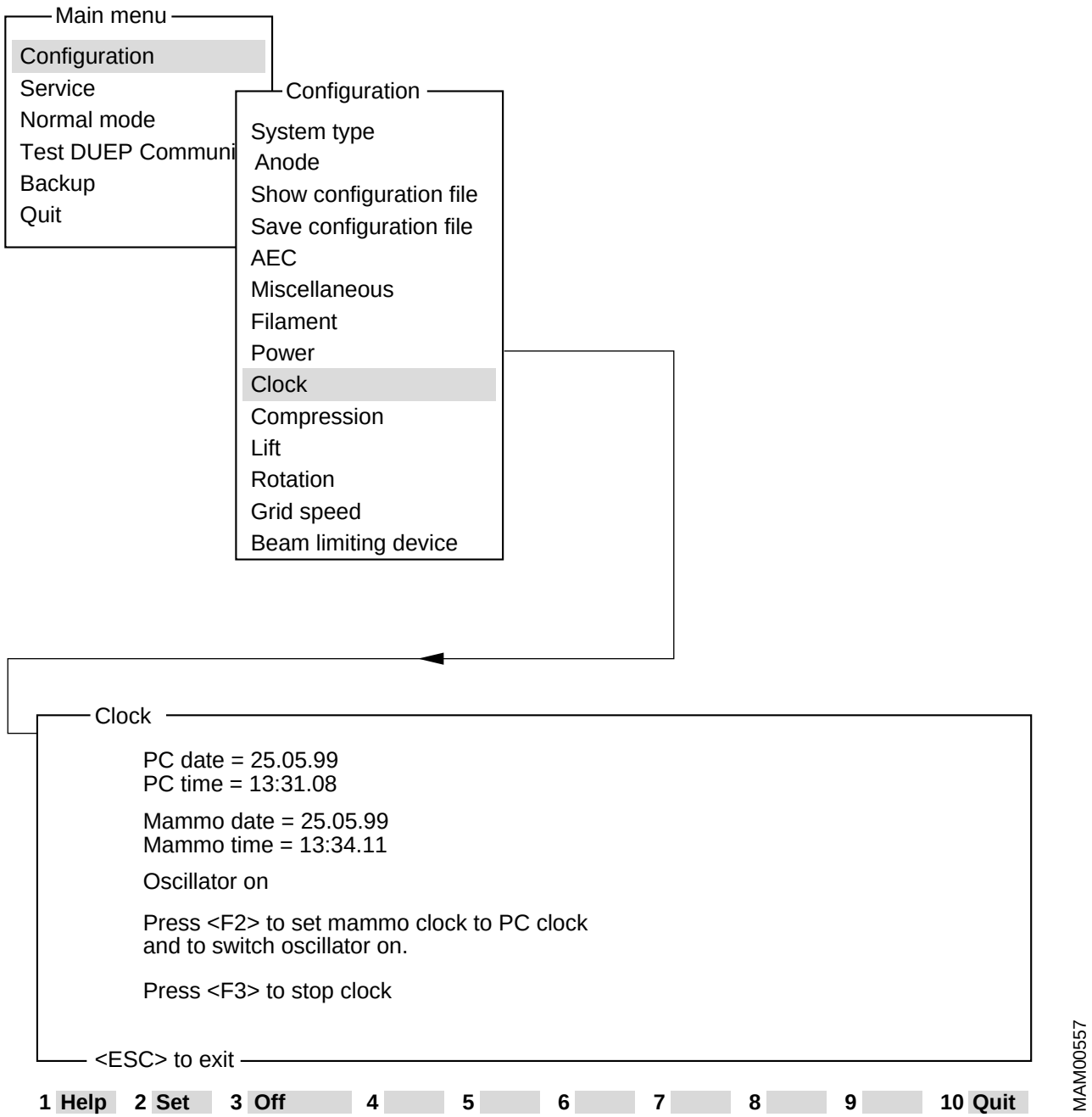


Fig. 22

Indicates date and time.

Date and time should be correct because they are used when storing an error message and marking films.

Compression

Compression -> Configuration

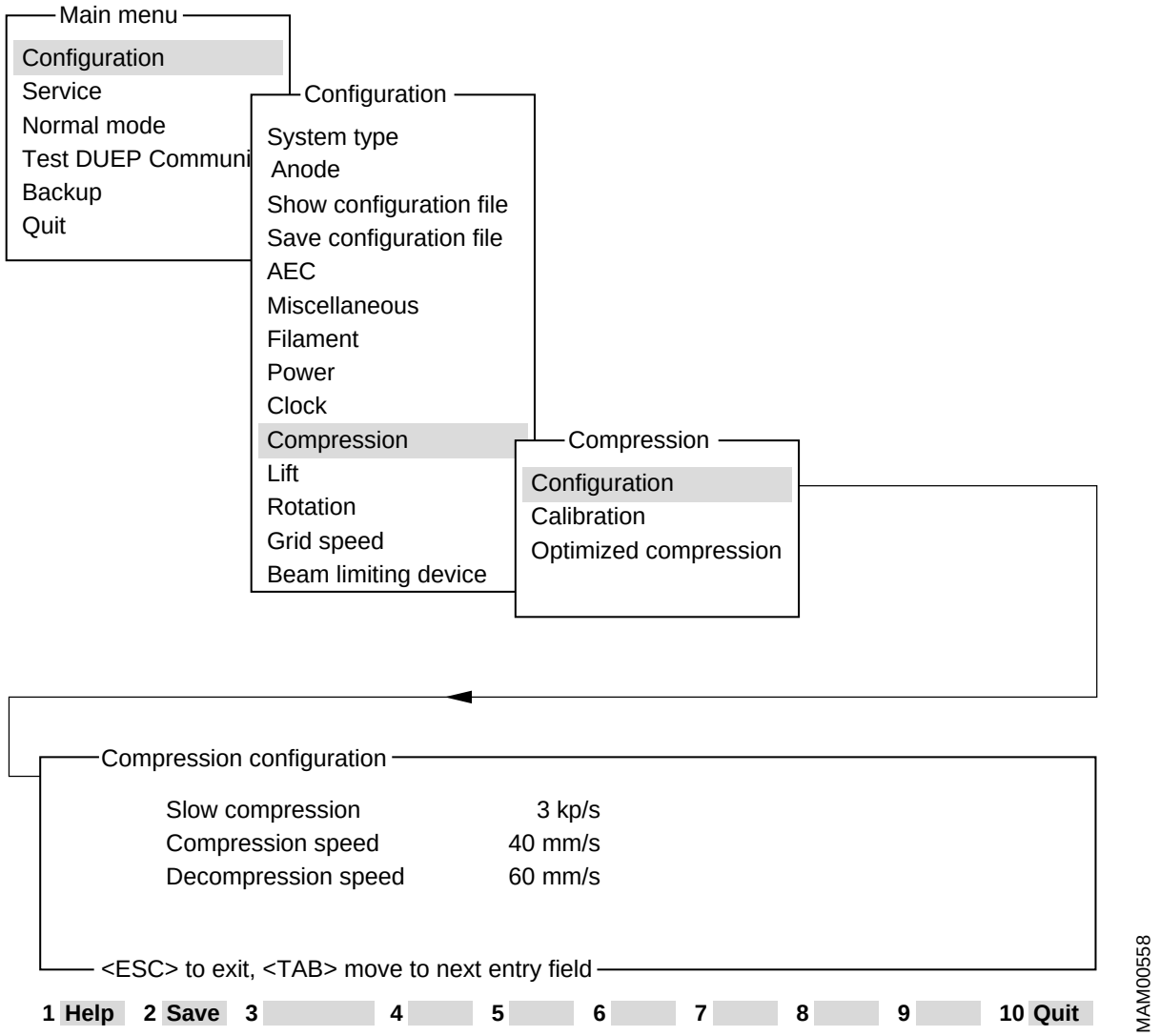


Fig. 23

Slow compression

When compression force exceeds 1 kg (10N), the force increase per second is regulated. The value indicates the reference value for the regulation.

Compression speed

Speed of compression plate in mm/s during compression.
Admissible values: 1 - 80. A higher value will not generate any error, nor will it cause any speed increase.

Decompression speed

Speed of compression plate in mm/s during decompression. Same values as above.

Compression -> Calibration

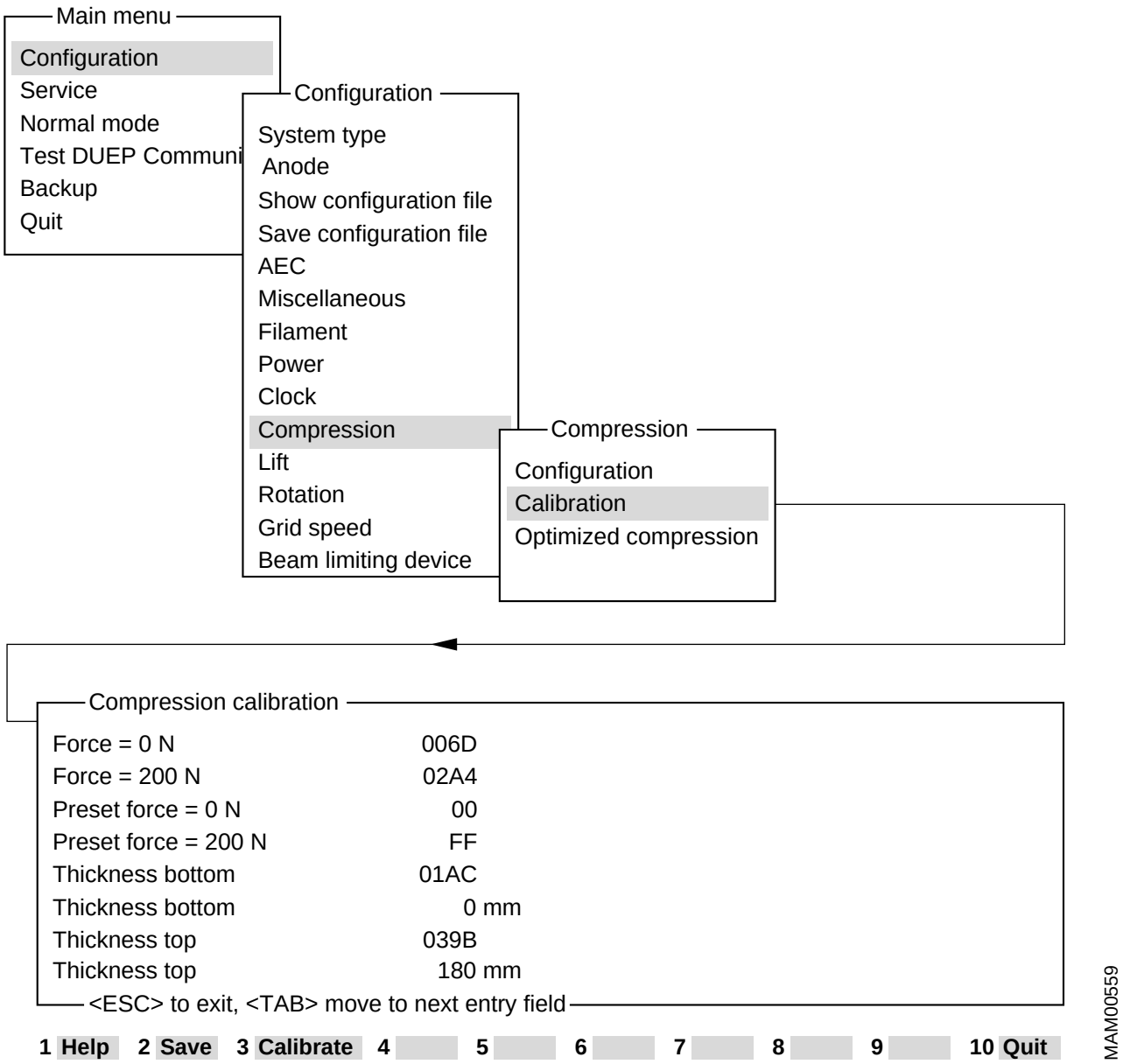


Fig. 24

Force = 0 N

Sampled calibration value for the force sensor at a compression force of 0 N after running the compression plate downwards. Stop before reaching the object table.

Force = 200 N

Sampled calibration value for the force sensor at a compression force of 200 N. Put the scale on the object table and compress to 200 N by motor only. If 200 N is exceeded, restart from 0 N!

Preset force = 0 N

Sampled calibration value with the preset force potentiometer set to minimum (turned counter clockwise to end position).

Preset force = 200 N

Sampled calibration value with the preset force potentiometer set to maximum (turned clockwise to end position).

Thickness bottom (HEX)

Sampled calibration value for the thickness sensor, when the compression plate is in bottom position.

Thickness bottom (mm)

Measured distance between compression plate and object table, when the compression plate is in bottom position. If the compression plate reaches the object table (normal case), type in 0.

Thickness top (HEX)

Sampled calibration value for the thickness sensor, when the compression plate is in uppermost position.

Thickness top (mm)

Measured distance between compression plate and object table, when the compression plate is in uppermost position. Measure with a ruler.

Compression -> Optimized compression

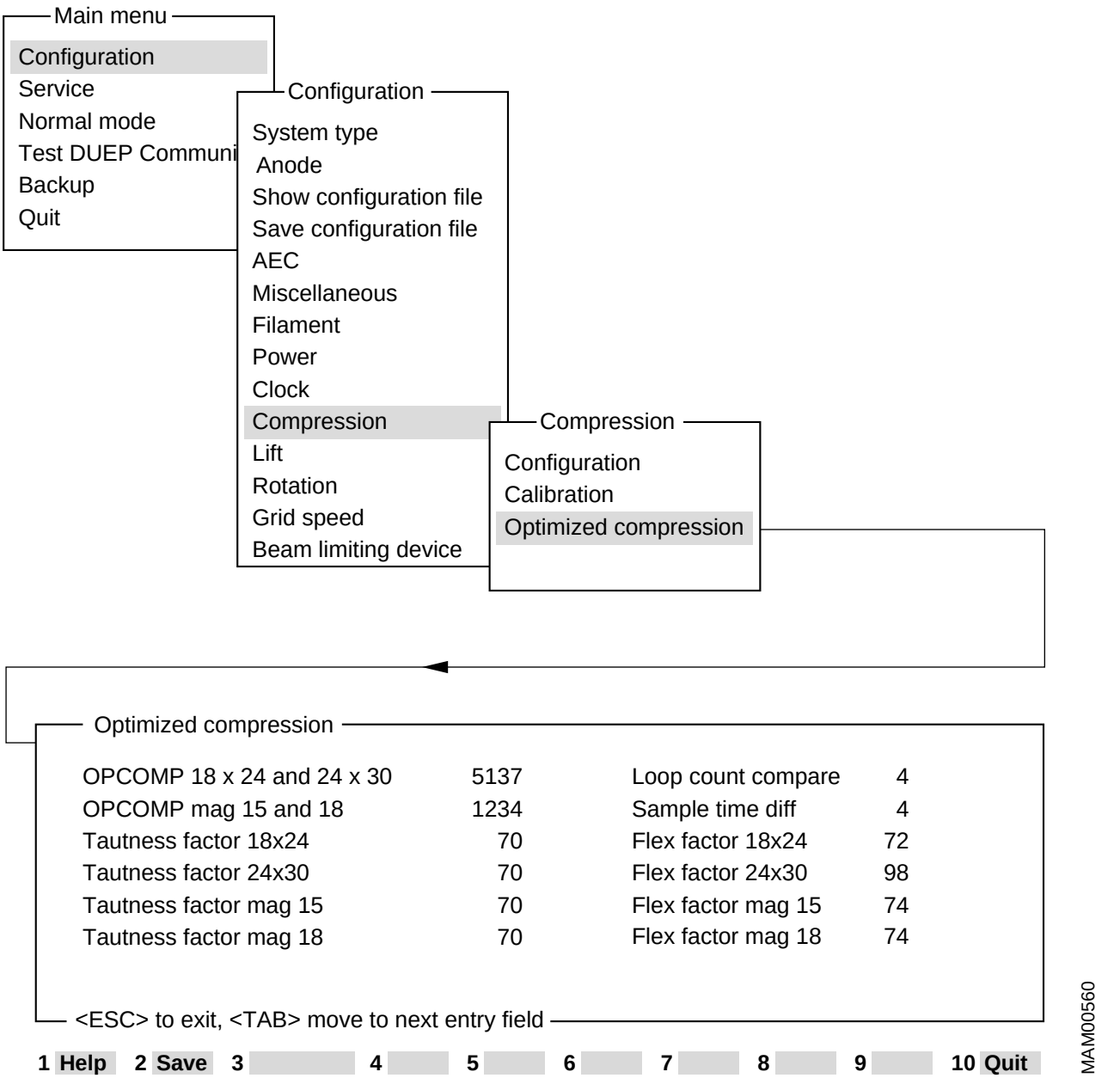


Fig. 25

OPCOMP code 18x24 and 24x30

Enable or disable OPCOMP. A correct input code will enable OPCOMP.

Adapting OPCOMP

If the factory-set OPCOMP is not to the customer's satisfaction, an adjustment can be made with the tautness factors in the "Optimized compression" table. A lower tautness value will increase the compression force and vice versa.

Increase/decrease the tautness factor by e.g. 10 the first time. Let the customer use this setting for at least two weeks, before further changes are made.

NOTE	**OPCOMP has been thoroughly tested by Siemens. If any factors are changed, OPCOMP will no longer be an optimization of compression force and image quality according to Siemens' clinical test.**

Tautness factor 18x24

This factor determines how hard a breast is pressed. Lower tautness factor gives more pressure to the breast.

Tautness factor 24x30

This factor determines how hard a breast is pressed. Lower tautness factor gives more pressure to the breast.

Tautness factor mag 15 (not used)

This factor determines how hard a breast is pressed when a magnification table 1.5 is attached. Lower tautness factor gives more pressure to the breast.

Tautness factor mag 18 (not used)

This factor determines how hard a breast is pressed when a magnification table 1.8 is attached. Lower tautness factor gives more pressure to the breast.

Loop count compare

Number of times that OPCOMP condition should be fulfilled to stop compression.

Sample time diff

Table index difference (time) between samples of thickness, used to determine if OPCOMP condition is fulfilled.

Flex factor 18x24

A value of the mechanical system's flexibility. The value is usually factory defined.

Flex factor 24x30

A value of the mechanical system's flexibility. The value is usually factory defined.

Flex factor mag 15 (not used)

A value of the mechanical system's flexibility for magnification table 1.5. The value is usually factory defined.

Flex factor mag 18 (not used)

A value of the mechanical system's flexibility for magnification table 1.8. The value is usually factory defined.

Lift

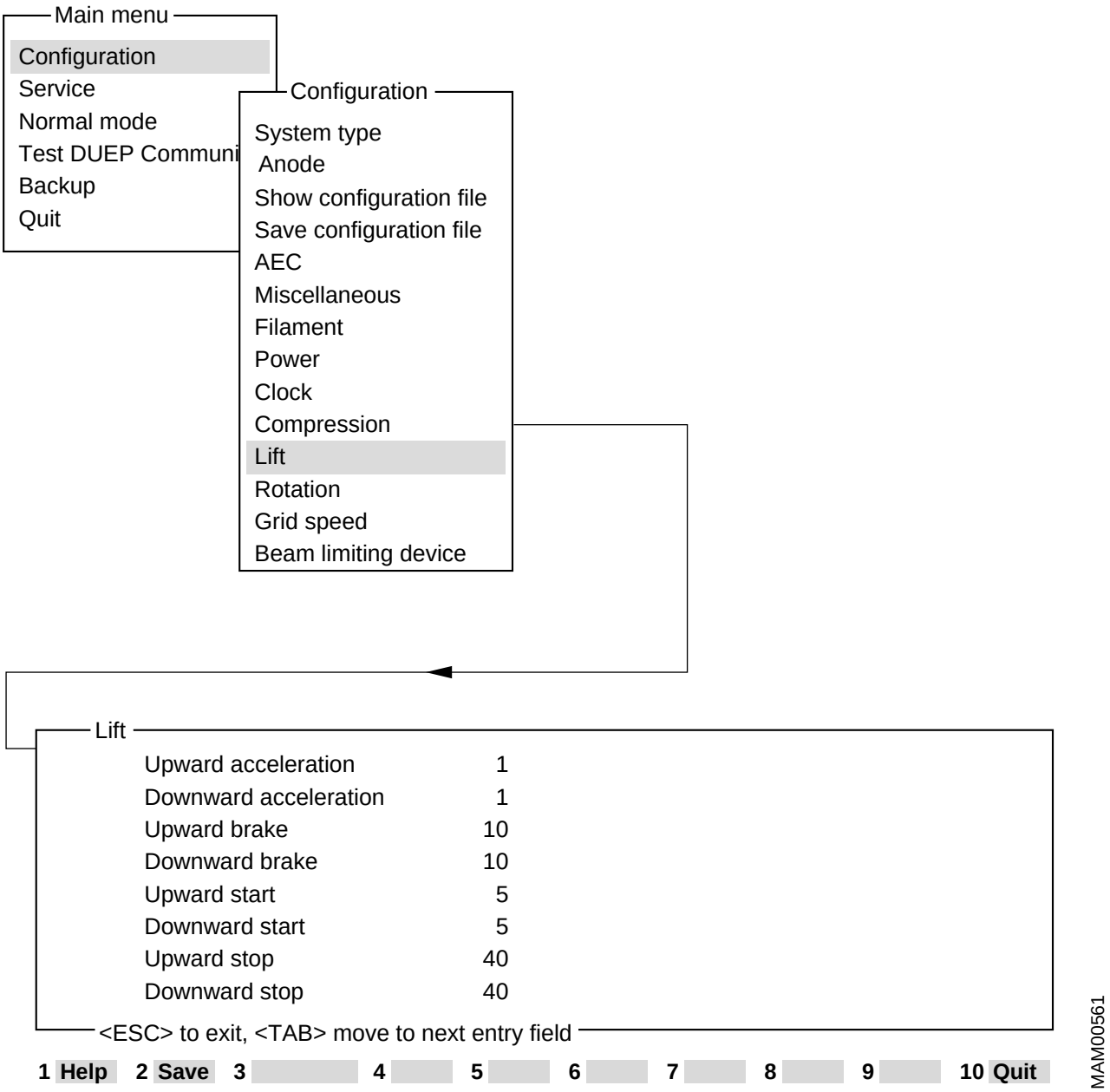


Fig. 26

Upward acceleration

To attain desired acceleration of the lift movement, the pulse width of the motor-control signal is ramped up. The digit is a measure of the acceleration rate at the start of the lift movement in upward direction. It indicates the increase of the duty cycle on the signal for each change event, which occurs every 10 ms.
Admissible values: 1 - 99. The higher the value the faster the acceleration.

Downward acceleration

Same as above, but for downward lift movement.
Admissible values: 1 - 99

Upward brake

To attain desired de-acceleration of the lift movement, the pulse width of the motor-control signal is ramped down. The digit is a measure of at which de-acceleration rate the upward lift movement stops. It indicates the decrease of the duty cycle on the signal for each change event, which occurs every 10 ms.
Admissible values: 1 - 99. The higher the value the faster it slows the motor down.

Downward brake

Same as above, but for downward lift movement.
Admissible values: 1 - 99

Upward start

To enable instantaneous start of the upward movement, the motor-control signal starts with a predetermined pulse width. The digit is a measure of the size of the pulse width (in percentage of the supply voltage). Increase value, if movement does not start instantaneously, decrease value if movement starts too abruptly.
Admissible values: 1 - 99

Downward start

Same as above, but for downward movement.
Admissible values: 1 - 99

Upward stop

At upward movement, the parameter indicates at which duty cycle the ramping of the pulse width is interrupted and the pulse width set to zero.
Admissible values: 1 - 99

Downward stop

Same as above, but for downward movement.
Admissible values: 1 - 99

Rotation

Rotation -> Configuration

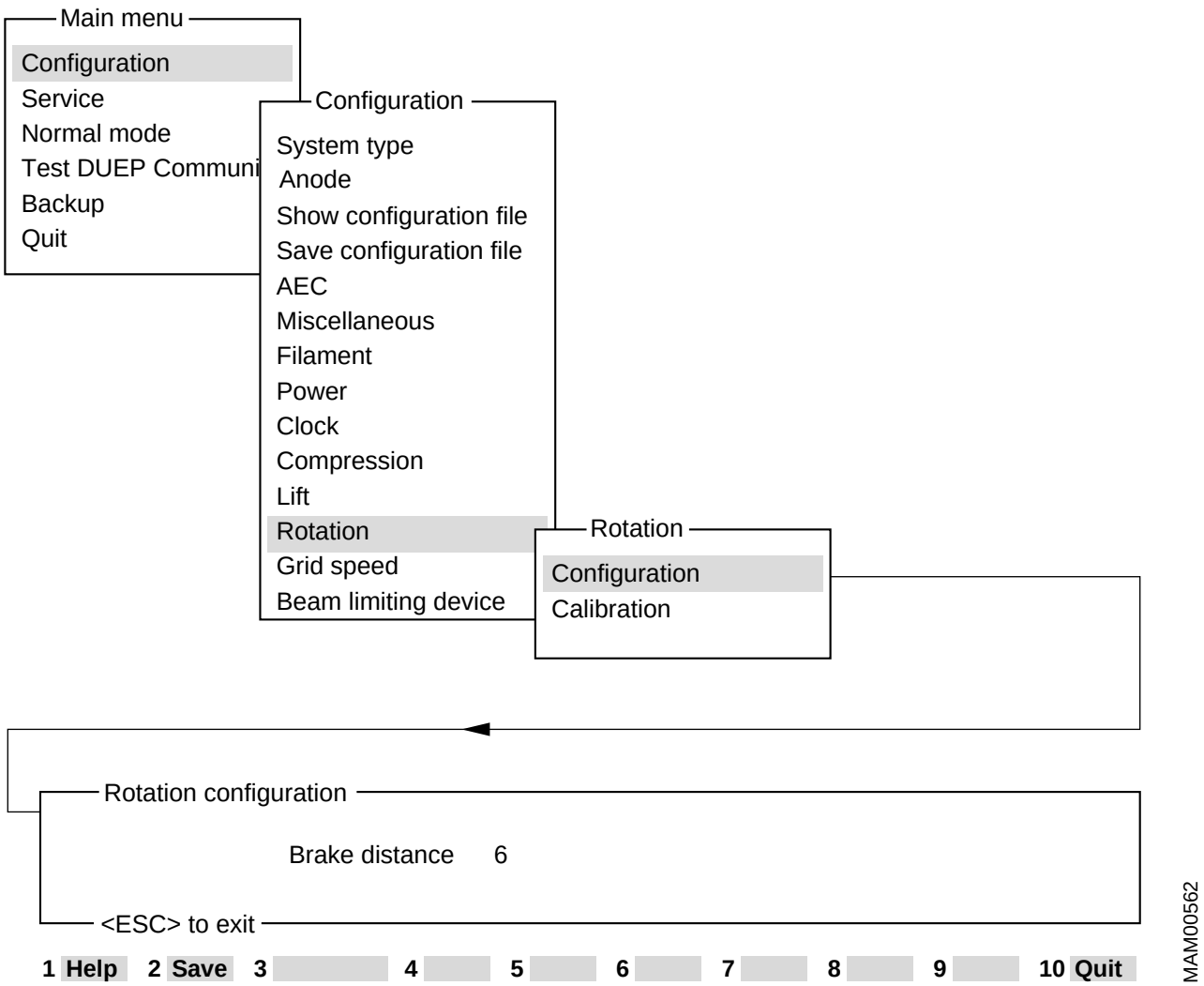


Fig. 27

The brake distance of the rotation of the swivel arm system is measured in degrees, i.e. how many degrees before the desired stop angle the rotation is being slowed down.

Rotation -> Calibration (When the system type is set to M1000.)

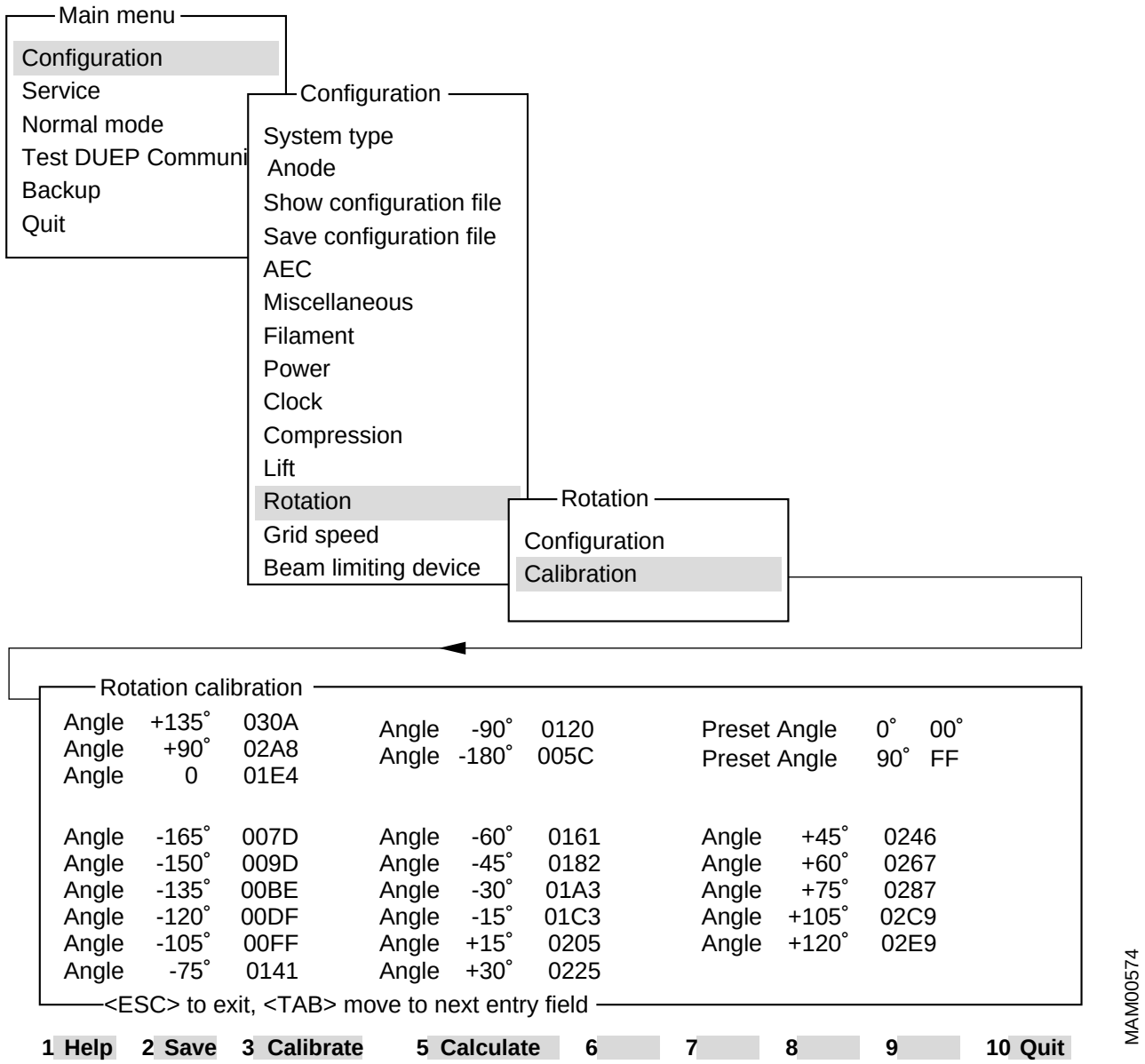


Fig. 28

F1	Displays a help text.
F2	Saves the values from the entry fields in the stand electronics.
F3	Measures the value for the highlighted entry field.
F4	Enters the measured value in the entry field. (after F3 or F5)
F5	Calculates theoretical values for all 15° steps (except for -90°, 0° and +90°) from -165° to +120° based on the values in the -180°, -90°, 0°, +90° and +135° entry fields.

NOTE	**F4 must be pressed after F5 and prior to F2 in order to save the calculated values.**

Preset Angle 0°

Highlight the entry field, set the preset angle potentiometer to minimum (fully counter-clockwise) and calibrate with F3, F4. Save with F2.

Preset Angle 90°

Highlight the entry field, set the preset angle potentiometer to maximum (fully clockwise) and calibrate with F3, F4. Save with F2.

Preparation for angle calibration

Prior to calibrating the angles, highlight +135° and enter 03FF, highlight +90° and enter 0300, highlight 0° and enter 0200, highlight -90° and enter 0100, highlight -180° and enter 0000, press F5 followed by F4. Save with F2.

Angle +135°, +90°, 0°, -90°, -180°

Highlight +135°. Run the rotation motor to +135° (near the CW stop). Calibrate the value with F3 followed by F4. Highlight +90°. Run the rotation motor to +90°. Calibrate the value with F3 followed by F4. Repeat this for 0°, -90° and -180°.

Remaining angles

Press F5 followed by F4 to calculate values for the remaining angles. Save with F2.

NOTE	**The angles must be reprogrammed if the tube angle pot. R803, or the CPU D801 is changed.**

Rotation -> Calibration (When the system type is set to M3000 Nova.)

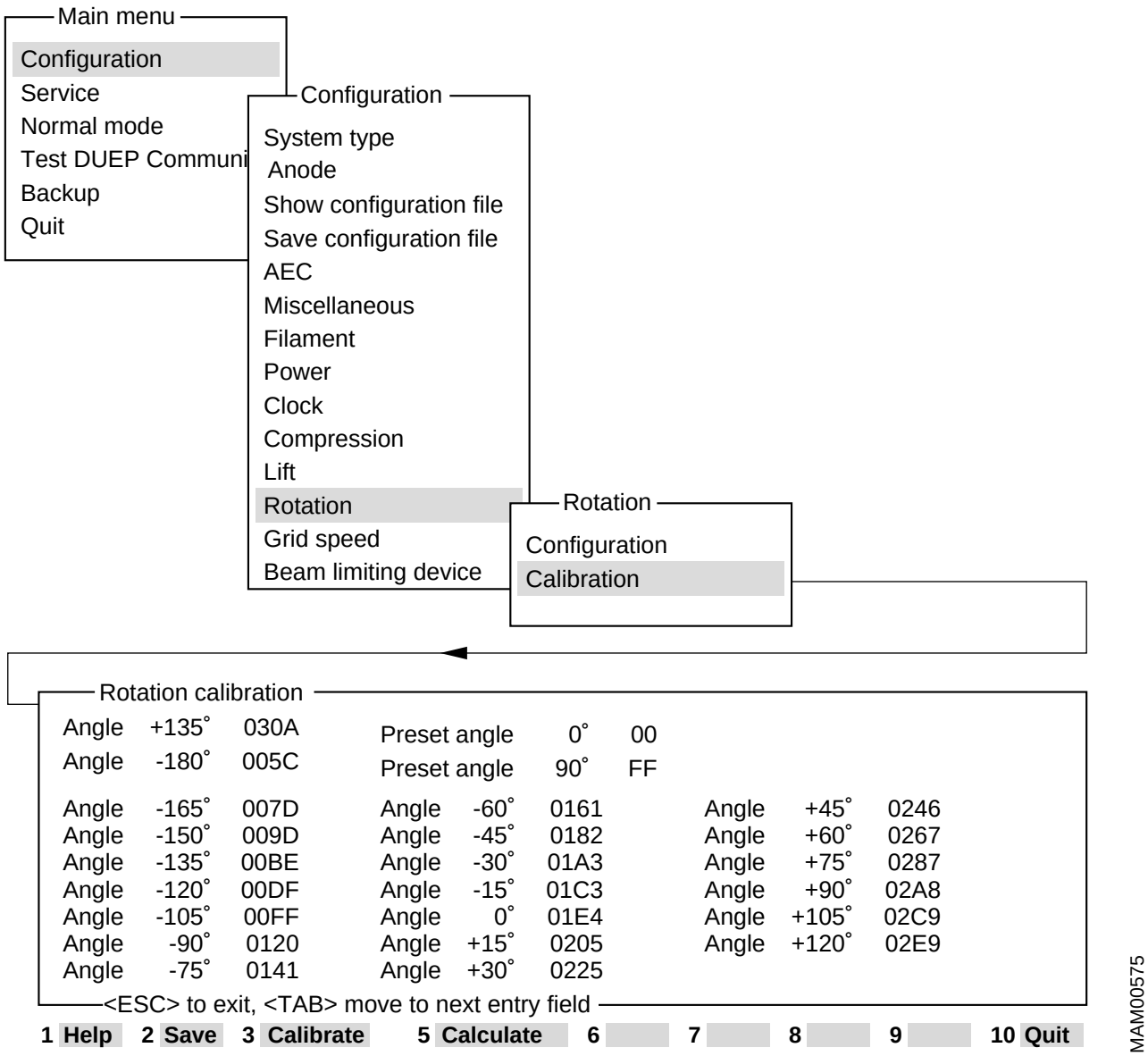


Fig. 29

F1 Displays a help text.

F2 Saves the values from the entry fields in the stand electronics.

F3 Measures the value for the highlighted entry field.

F4 Enters the measured value in the entry field. (after F3 or F5)

F5 Calculates theoretical values for all 15° steps from -165° to +120° based on the values in the -180° and +135°entry fields.

NOTE **F4 must be pressed after F5 and prior to F2 in order to save the calculated values.**

Preset Angle 0°

Highlight the entry field, set the preset angle potentiometer to minimum (fully counter-clockwise) and calibrate with F3, F4. Save with F2.

Preset Angle 90°

Highlight the entry field, set the preset angle potentiometer to maximum (fully clockwise) and calibrate with F3, F4. Save with F2.

Preparation for angle calibration

Prior to calibrating the angles, highlight +135° and enter 03FF, highlight -180° and enter 0000, press F5 followed by F4. Save with F2.

Angle +135°

Highlight +135°. Run the rotation motor to approx. +135° (near the CW stop) and move the stereo lever fully to stereo position. If necessary, rotate the head slightly with the motor until the lever can be fully engaged. Rotate the head upwards (towards 0°) to the stereo stop and back to the center position until it stops. Calibrate the value with F3 followed by F4.

Angle -180°

Highlight -180°. Run the rotation motor to approx. -180° (near the CCW stop) and move the stereo lever fully to stereo position. If necessary, rotate the head slightly until the lever can be fully engaged. Rotate the head upwards (towards 0°) to the stereo stop and back to the centre position until it stops. Calibrate the value with F3 followed by F4.

Angle -165° to +120°

Press F5 followed by F4 to recalculate approximate values for the angles prior to calibration of the remaining angles. Save with F2.

Highlight -165°. Run the rotation motor to approx. -165° and move the stereo lever fully to stereo position. If necessary, rotate the head slightly until the lever can be fully engaged. Rotate the head upwards (towards 0°) to the stereo stop and back to the centre position until it stops. Calibrate the value with F3 followed by F4.

Move the stereo lever back to normal mode and run the rotation motor to the next position, -150°. Highlight -150° and calibrate as above. Calibrate all the remaining values in the table in the same manner. It is sufficient to calibrate each value with F3, F4 and save all the values afterwards with F2.

Check 0° and all 15° steps from 0° to ±90° for proper stereo lever operation by setting the preset angle control to 15, 30°, etc. and run the rotation motor to both plus and minus angles. 0° is checked by allowing the head to stop when going from positive angle values to negative angle values and vice.versa. Re-calibration any angle which needs improvement by highlighting it and calibrating as above. Remember to save (F2) after performing a re-calibration.

NOTE **The angles must be reprogrammed if the tube angle pot. R803, or the CPU D801 is changed.**

Grid speed

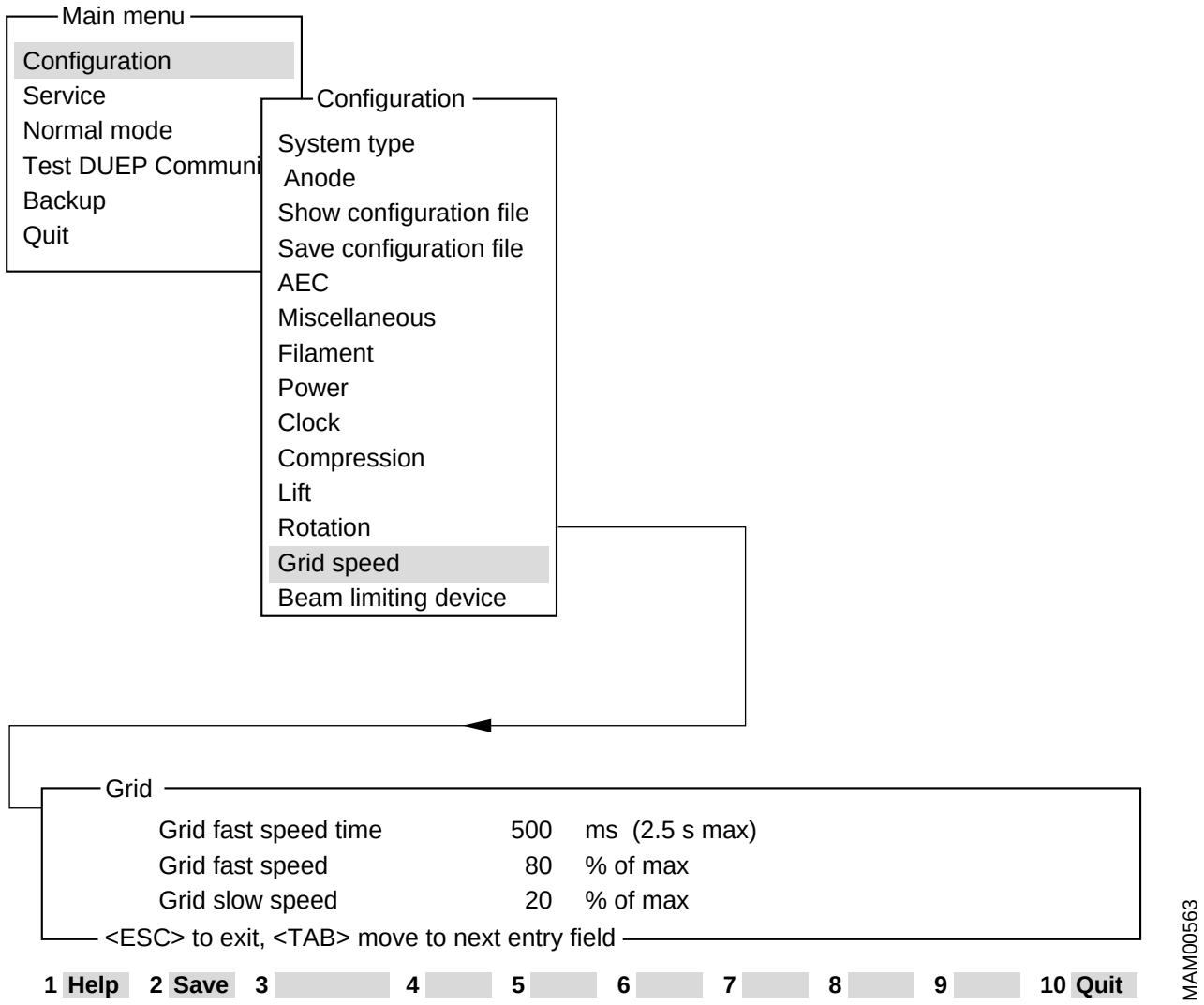


Fig. 30

Grid fast speed time

The time during which the grid is moving at high speed after start of radiation.
Admissible values: 10 - 2500 ms

Grid fast speed

Indicates the high-speed reciprocation of the grid applied after start, i.e. during exposure. The speed is indicated as a percentage of the maximum pulse width of the grid motor-control signal.
Admissible values: 1 - 99. The higher the value the faster the motor.

Grid slow speed

Indicates the low speed of the grid after transition from high speed. The speed is indicated as a percentage of the maximum pulse width of the grid motor-control signal.

Beam limiting device

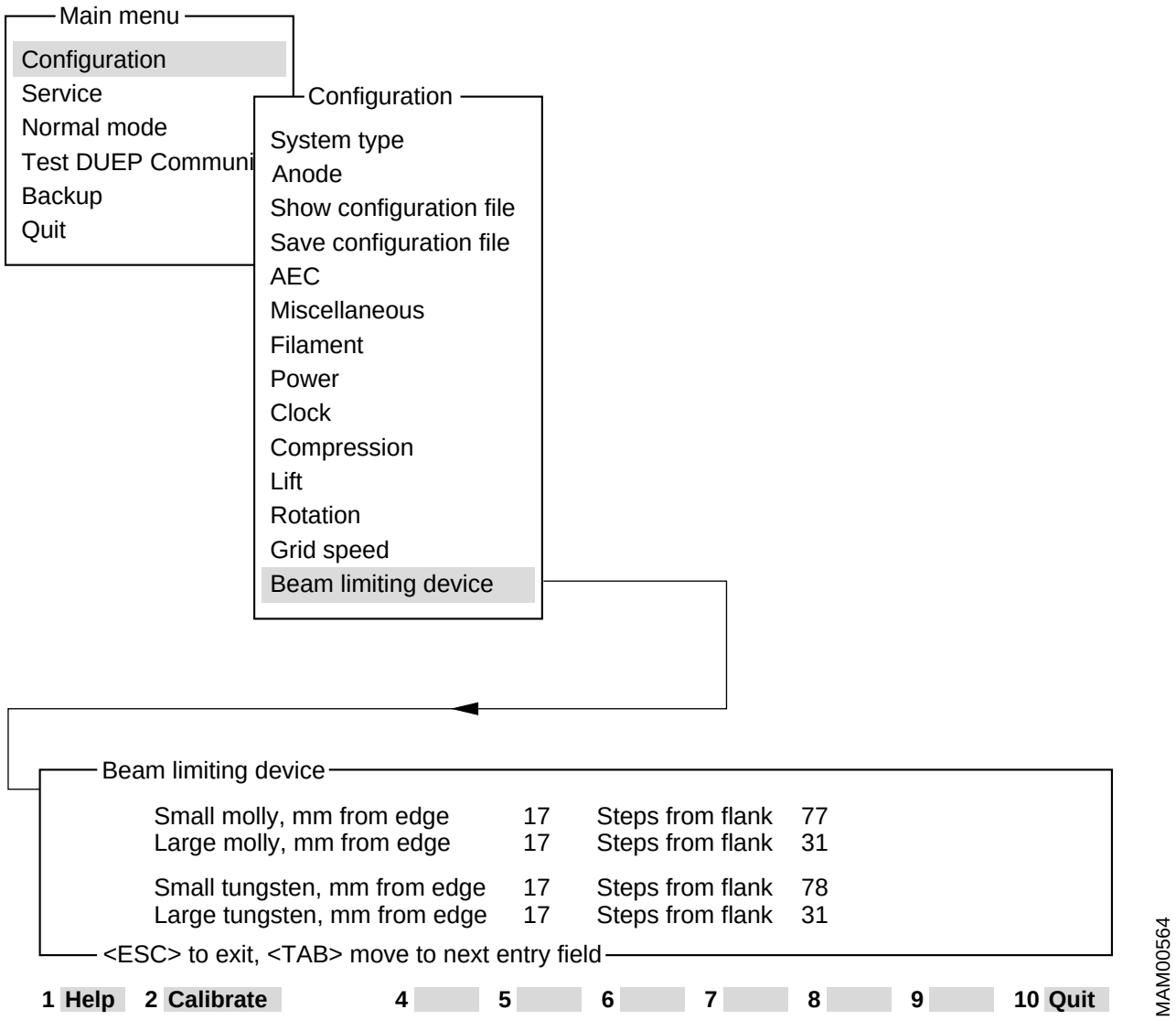


Fig. 31

mm from edge (focus)

Number of mm:s from film edge to radiation field after a calibration exposure. Set to 17 when doing a calibration exposure.

Steps from flank

A calculated, non-editable value showing how far from the middle of its moving area the beam limiting device will be moved.

NOTE	**The *Beam Limiting Device* menu is not selectable when the collimator is set to Manual in configuration System type.**

Service

View error buffer

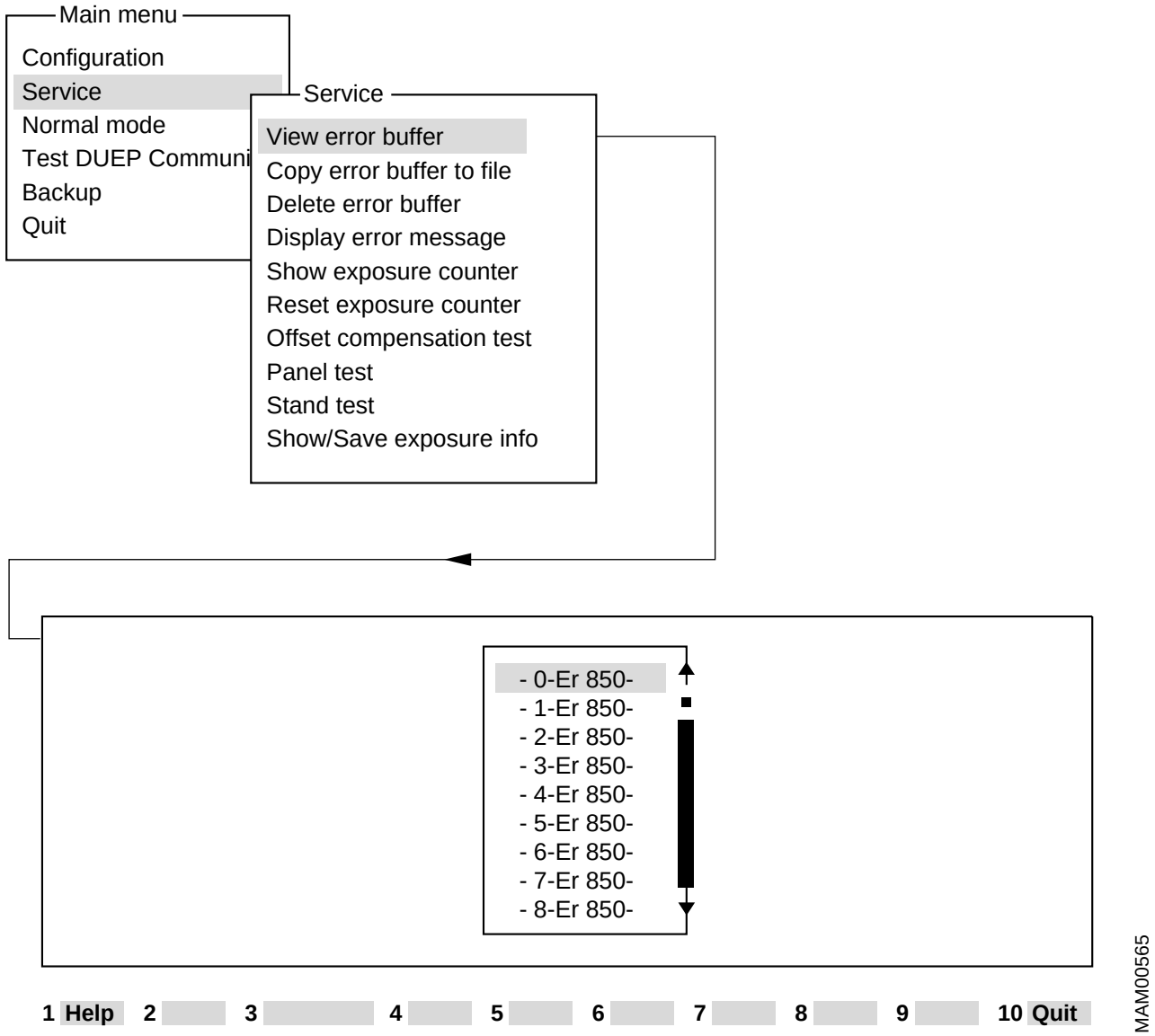


Fig. 32

With this selection of the “View error buffer” menu, the error buffer in the panel is read in and displayed on the screen. Using the arrow keys, you can now scroll through the entire error buffer. If you want more detailed information about the indicated error, just press <ENTER>. The error shown at the head of the list is the most recently occurred error. A maximum of 40 errors can be stored.

Copy error buffer to file

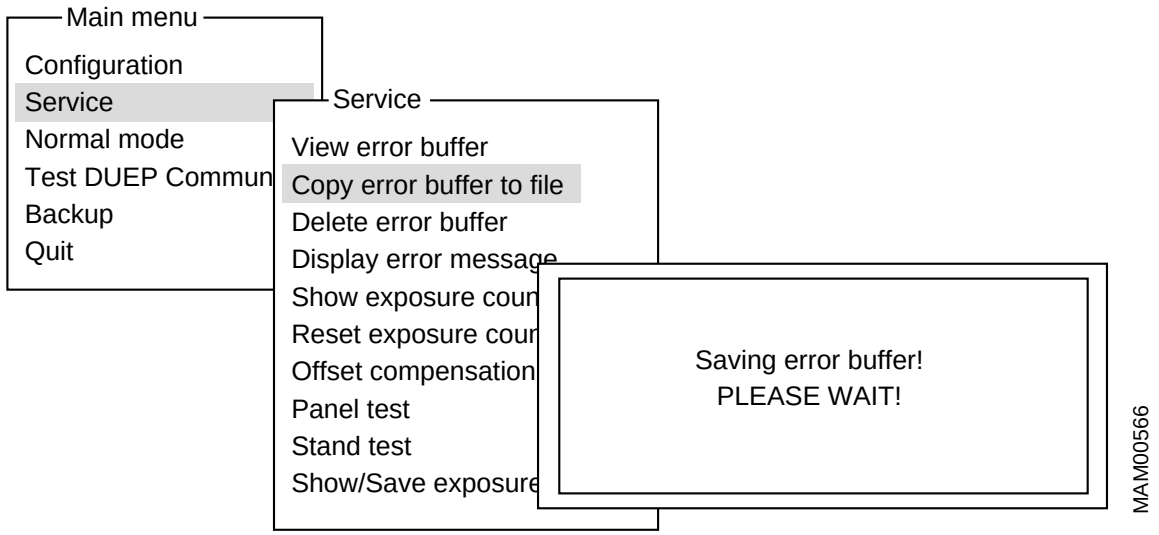


Fig. 33

Choosing this menu item will read the error buffer and save to the file C:errorbuf.txt.

When using the error buffer the first time the file errorbuf.txt is automatically created. This file will be stored on hard disk. If you want to have on the floppy belonging to the particular unit, transfer file to floppy.

Delete error buffer

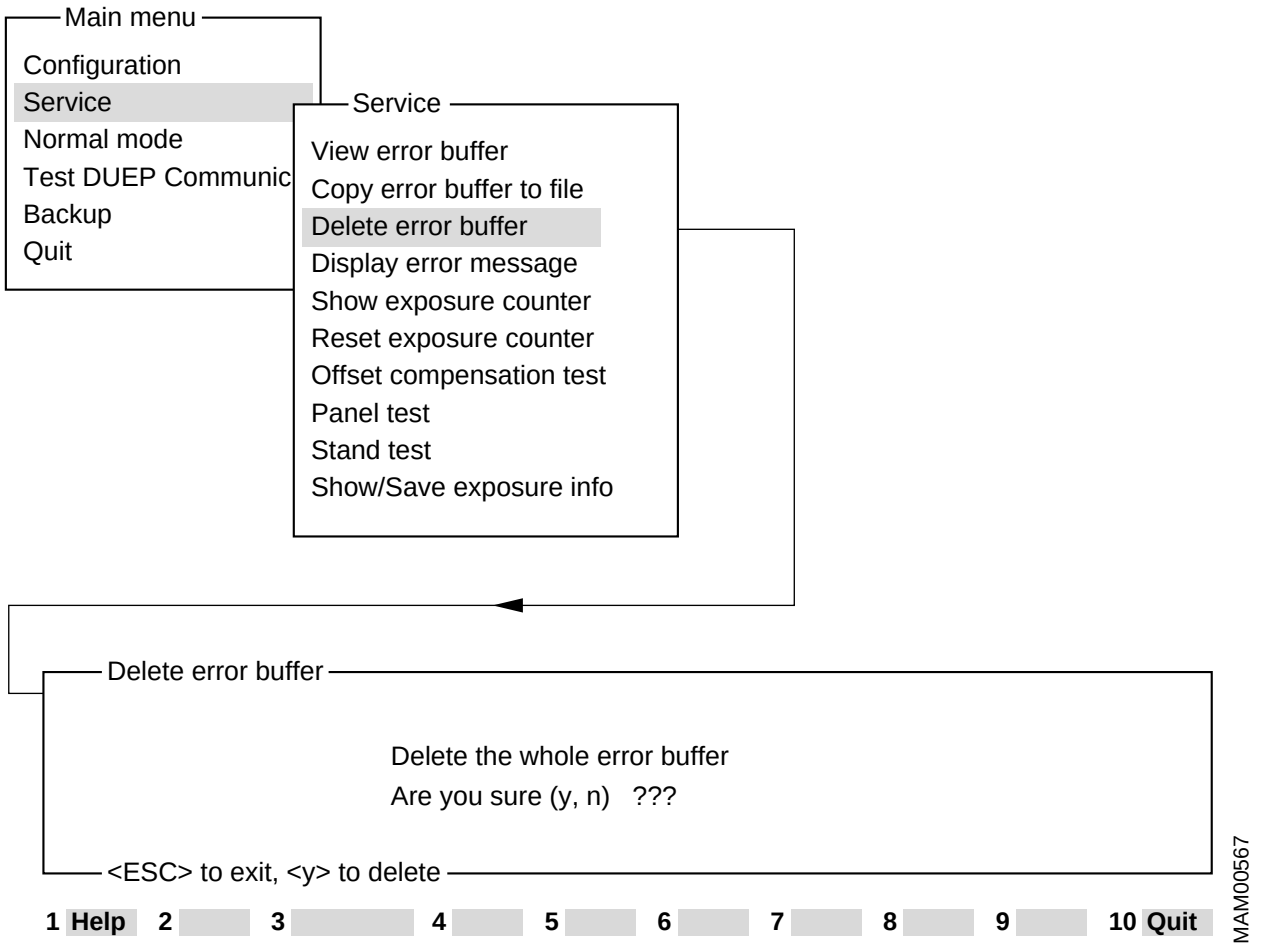


Fig. 34

Selecting the “Delete error buffer” menu and pressing the “Y” key empties the error buffer in the panel. If you then try to call up “View error buffer again, the service program will respond by displaying the message “Error buffer empty”.
It is recommended to empty the error buffer only on finishing a service call successfully!

Display error message

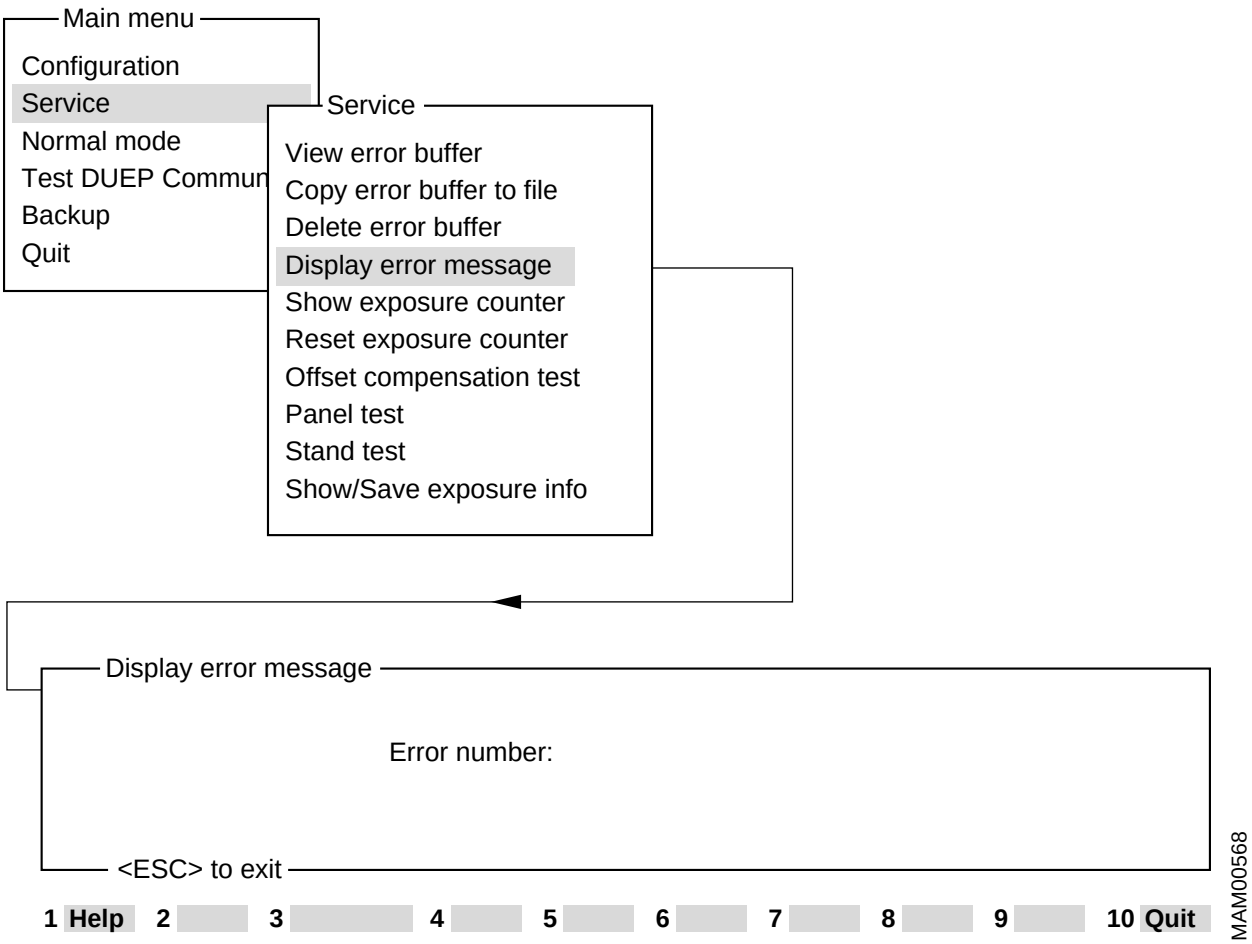


Fig. 35

A text explaining the error will be shown after input of an error number and <RETURN>.

Show exposure counter

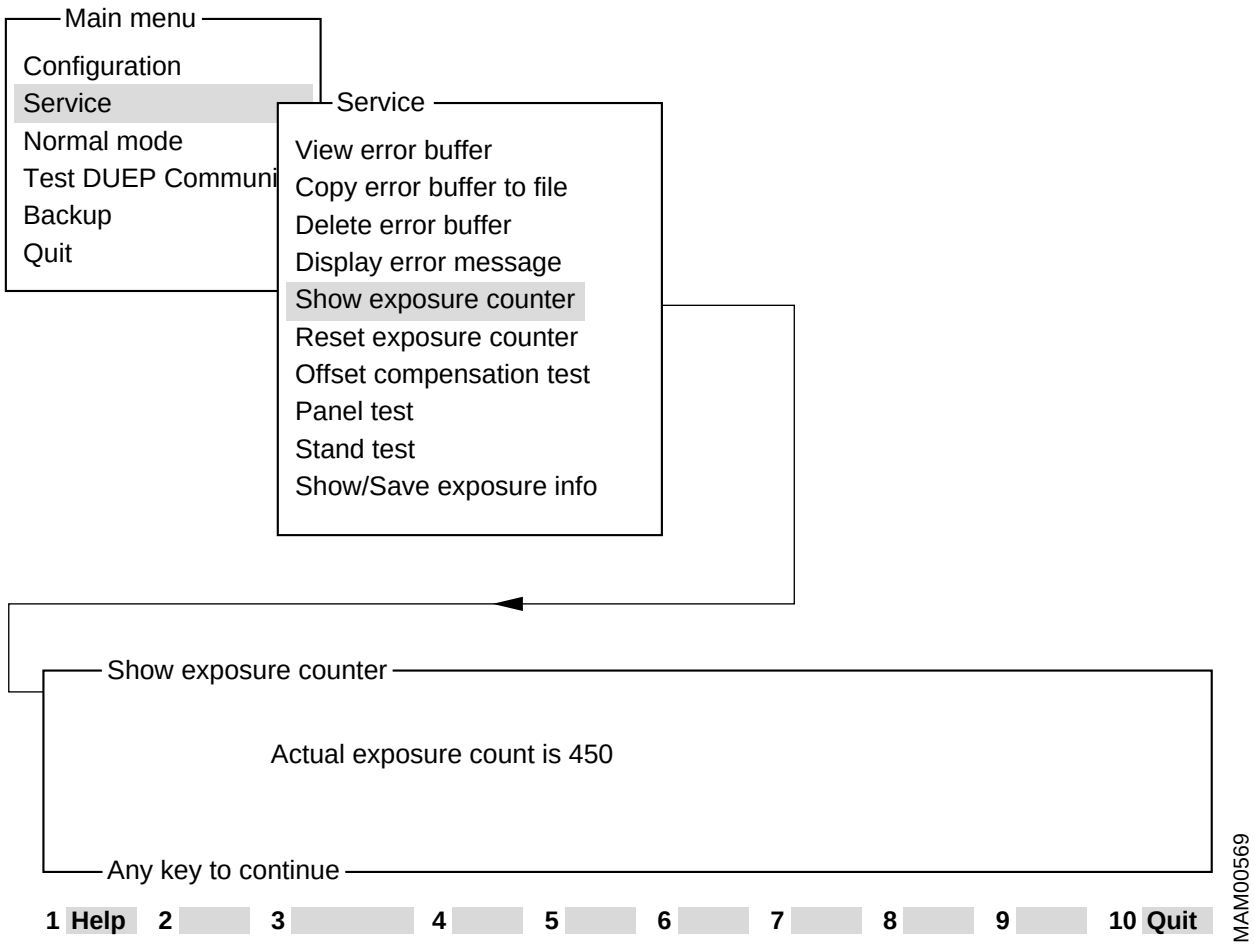


Fig. 36

By selecting the “Show exposure counter” menu, the exposure counter value in the panel is read in and displayed on the screen.

It is indicating the number of exposures taken with the attached X-ray tube.

Reset exposure counter

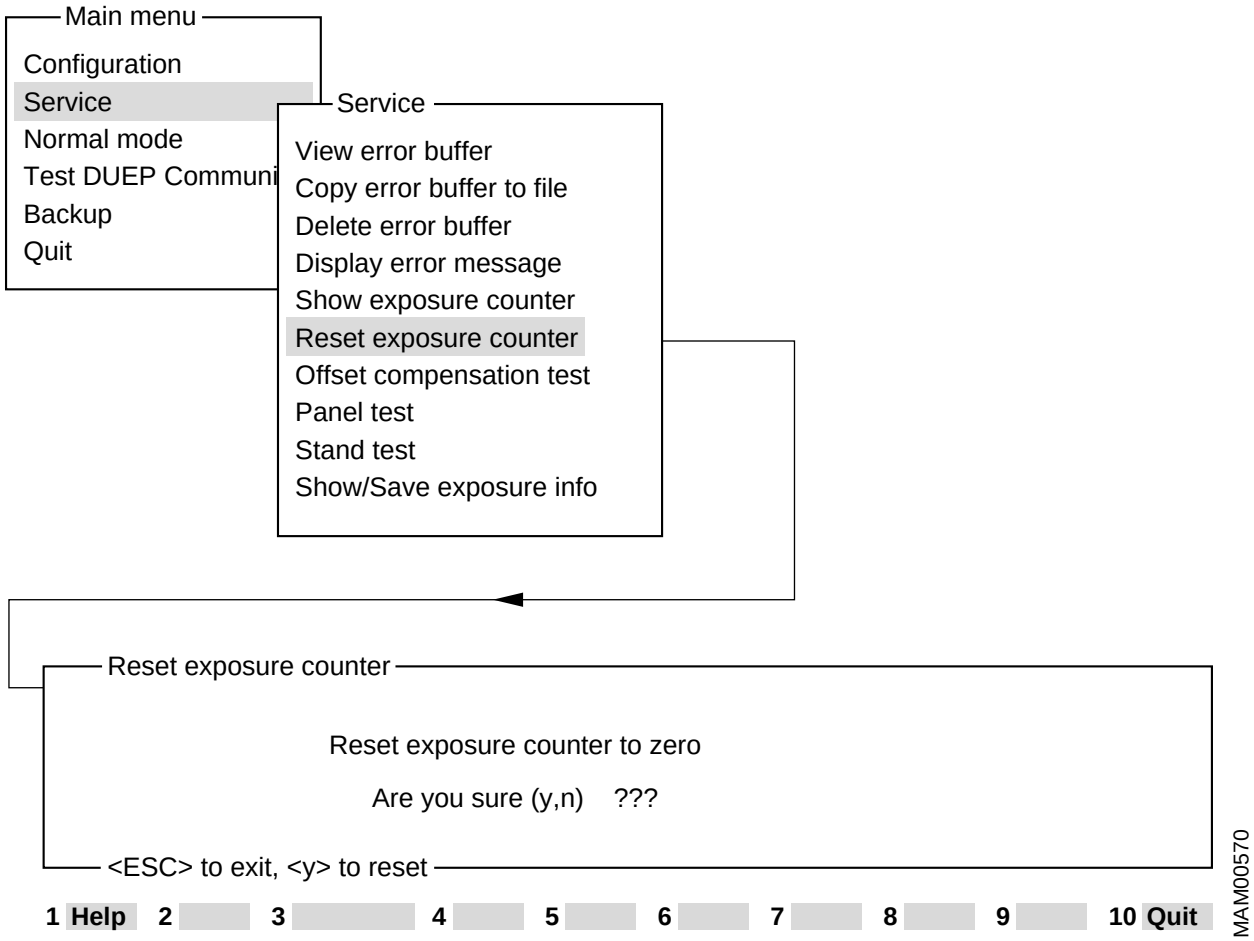
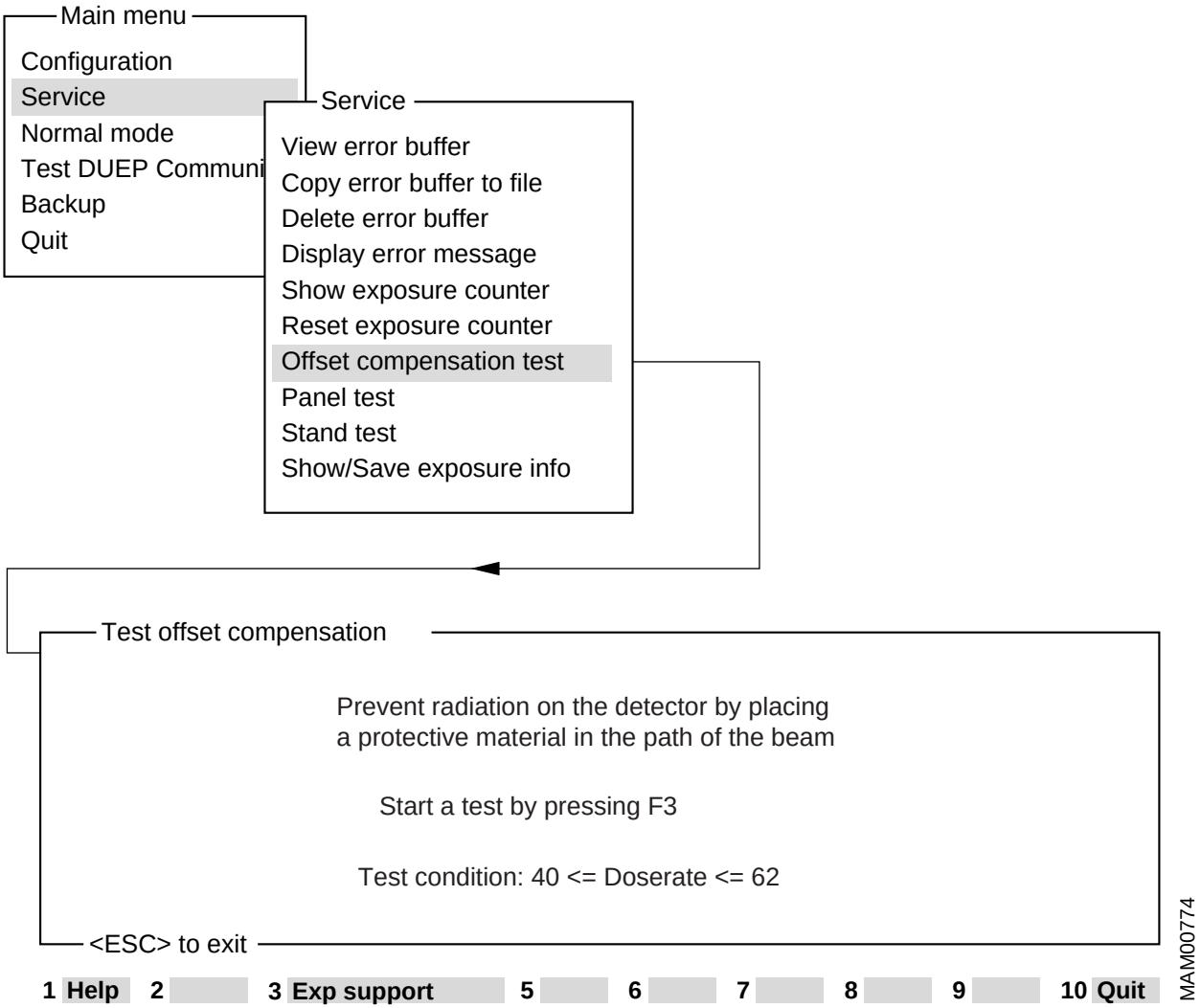


Fig. 37

Selecting the “Reset exposure counter” menu and pressing the “Y” key resets the exposure counter value in the panel to zero.

NOTE	**Only to be done after tube exchange.**

Offset compensation test



This menu is used for checking the offset of the AEC. It is necessary that a backup floppy is inserted when entering the menu since exposure data from the test will be stored on it, in the result file “offtest.txt”.

When pressing <F3> the correct exposure parameters will be set for the generator and a message box will appear, instructing the user to set the correct anode/filter combination and then pressing <Enter>. After an exposure has been released, the measured dose rate value is displayed in the menu. If the value differs from specified limits an error indication will be displayed.

Panel test

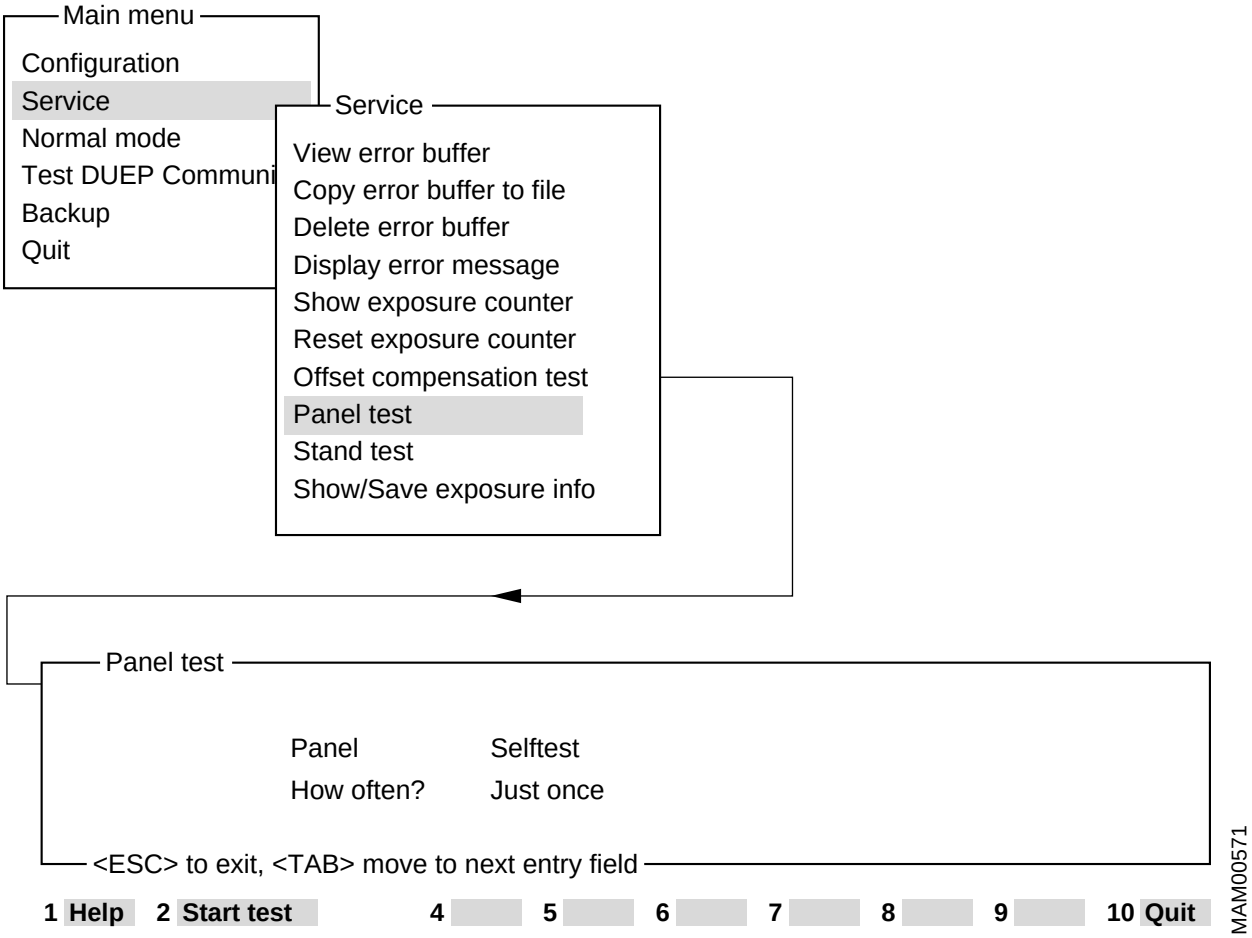


Fig. 38

When pressing F2 Start test, the panel self test will start.

Stand test

Stand test -> A/D-converter

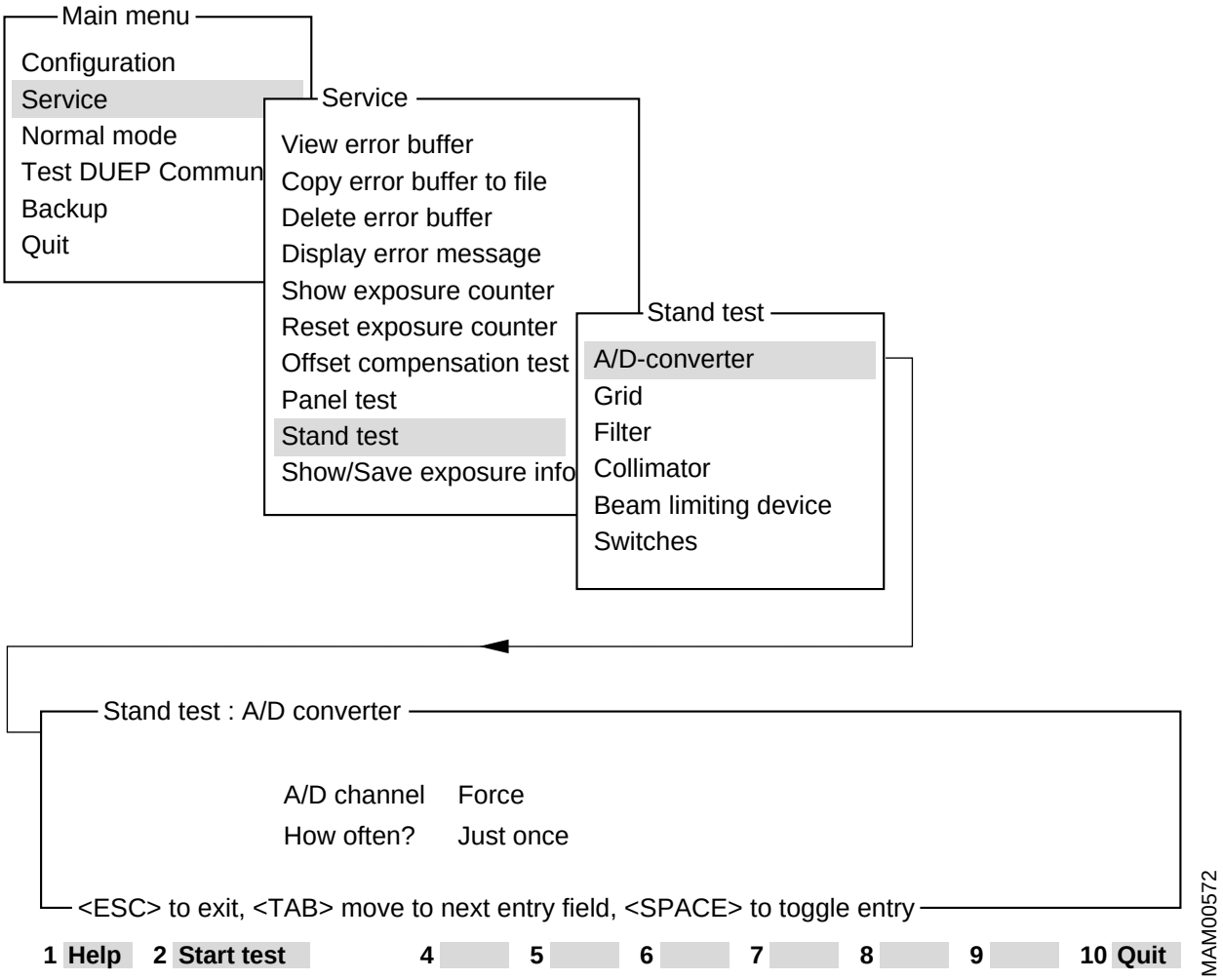


Fig. 39

A/D converter test

This menu displays two fields for selection of test data. Desired field is selected with the TAB key.

In the first field you can choose which analog input (to the CPU in the stand) shall be read off.

The possible inputs are: Force, Angle, Thickness, Preset force, Preset angle, Grid motor V and Pot check.

In the second field you can choose whether the reading shall be carried out just once or continuously (until interruption).

In both fields you can scroll through the different alternatives by pressing the spacer. Press F2 or the return key to read off desired alternative.

Stand test, grid

Selection of this menu immediately starts the grid test. If a grid movement error is detected, an error message is displayed, as usual, on the control panel.

Stand test, filter

Selection of this menu immediately starts the filter test. If a filter movement error is detected, an error message is displayed, as usual, on the control panel.

Stand test, collimator

Selection of this menu immediately starts the collimator test. If a collimator movement error is detected, an error message is displayed, as usual, on the control panel.

Stand test, beam limiting device

Selection of this menu immediately starts the beam limiting device test. If a beam limiting device movement error is detected, an error message is displayed, as usual, on the control panel.

NOTE	**Stand test filter, stand test collimator and stand test beam limiting device is not selectable when the collimator is set to Manual.**

Stand test -> Switches

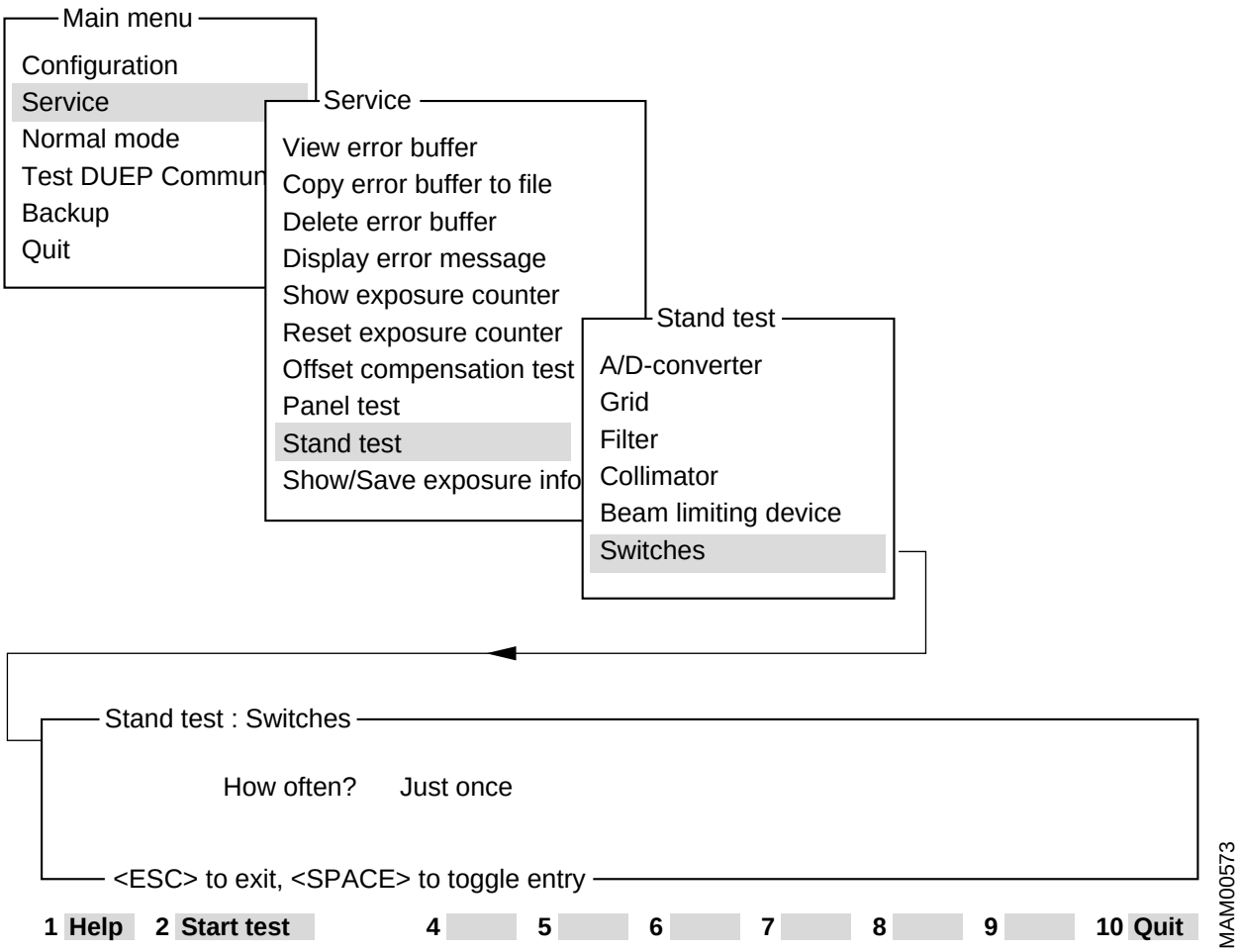
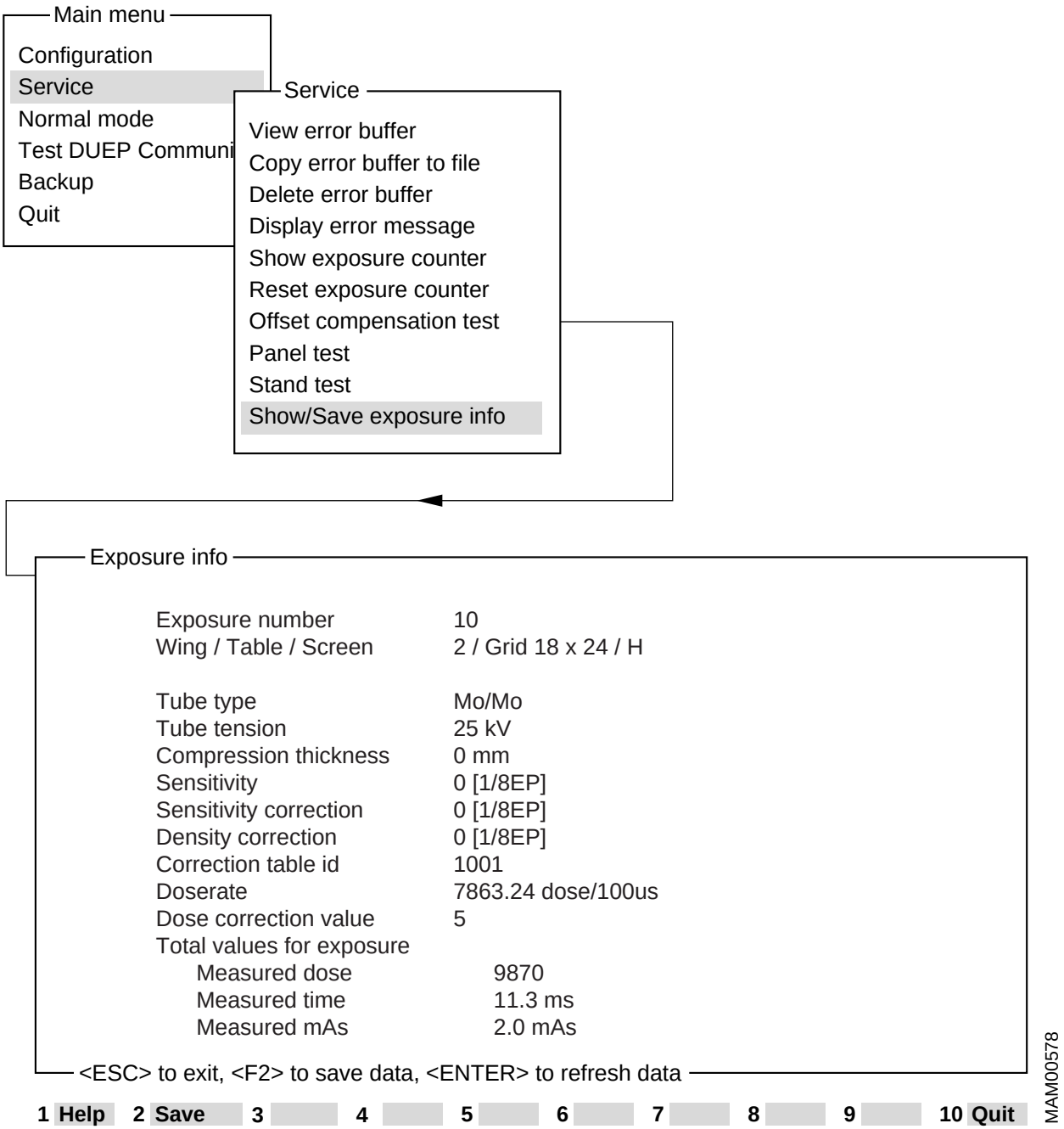


Fig. 40

Switches

This menu displays one field for selection of test data. You can choose whether the position reading of the switches shall be carried out just once or continuously (until interruption). Press the spacer to choose between these two different alternatives. Press F2 or the return key to read off desired alternative.

Show/Save exposure info



This menu displays exposure data from the latest exposure. Pressing <ENTER> will update the exposure data.

If an exposure has been made in AEC-mode the exposure data can be saved by pressing <F2>. The result file will automatically be located in the same directory as the Service Program was started from. The name of the result file will be AE991105.txt (i.e. current date picked from the PC plus ".txt").

Tube type

Displays the anode/filter combination used during exposure.

Tube tension

Displays the kV-setting (on the control panel) used during the exposure.

Compression thickness

Displays the compression thickness used during exposure.

Sensitivity

Displays the sensitivity value used during the exposure. The sensitivity is dependent on selection of speed H or D.

Sensitivity correction

Displays the sensitivity correction value used during exposure. The sensitivity correction is dependent on selection of object table type, speed (H or D) and on anode/filter combination.

Density correction

Displays the density correction value set on the control panel during exposure.

Correction table ID

Displays the ID number of the correction table used during exposure.

Dose rate

Displays the value of measured dose rate (counted in pulses per 100 µs) during exposure.

Dose correction value

Displays the correction value used during exposure and measured in pulses. The correction value is determined by comparing dose rate with values in the AEC correction table.

Measured dose

Displays the total dose, measured in pulses.

Measured time

Displays the total time for the exposure.

Measured mAs

Displays the value of measured mAs during the exposure.

Normal mode

Generator data

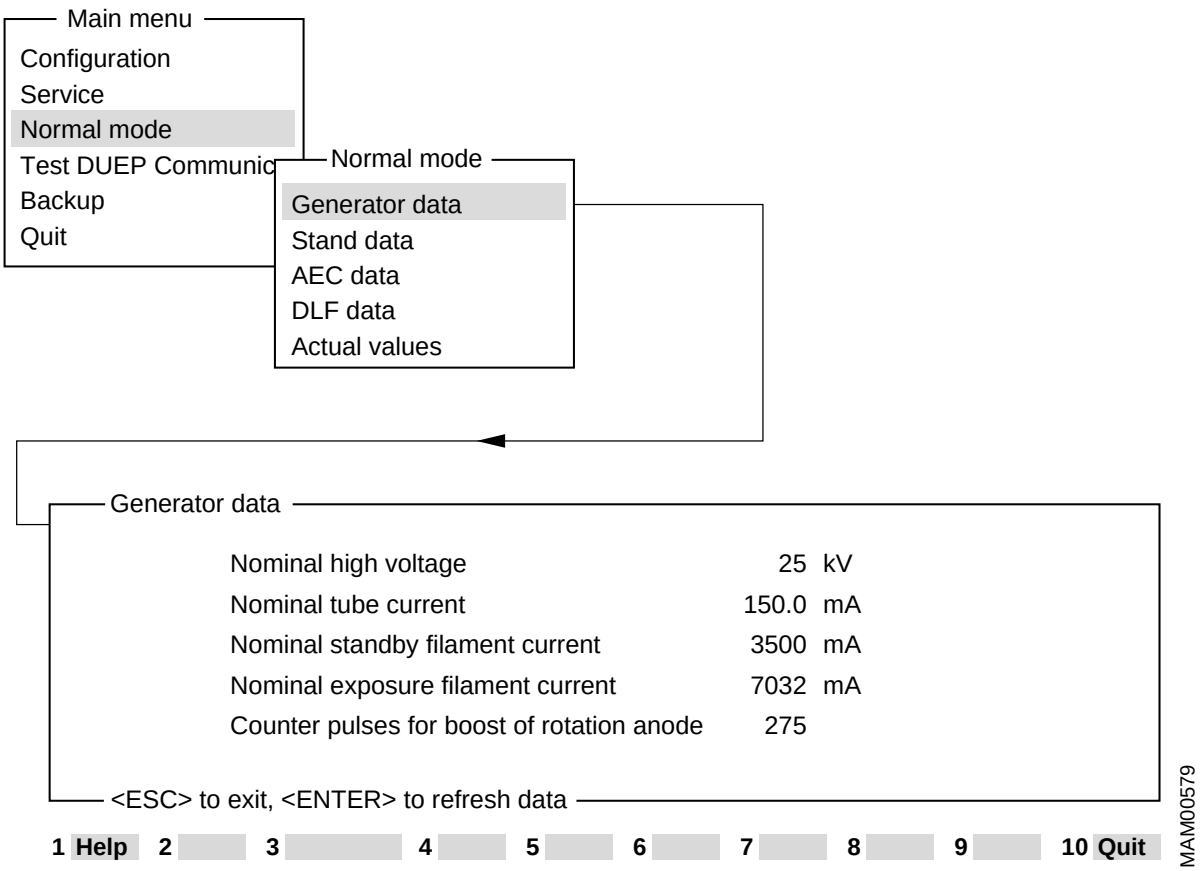


Fig. 41

NOTICE **None of the menus under “Normal mode” are editable.**

Nominal high voltage

Shows the kV set on the control panel.

Nominal tube current

Shows the nominal value of the tube current.

Stand-by filament current

Shows the nominal value of the stand-by filament current.

Exposure filament current

Shows the nominal value of the filament preparation.

Counter pulses for boost of rot. anode

Shows the number of inverter pulses used for the anode acceleration.

Stand data

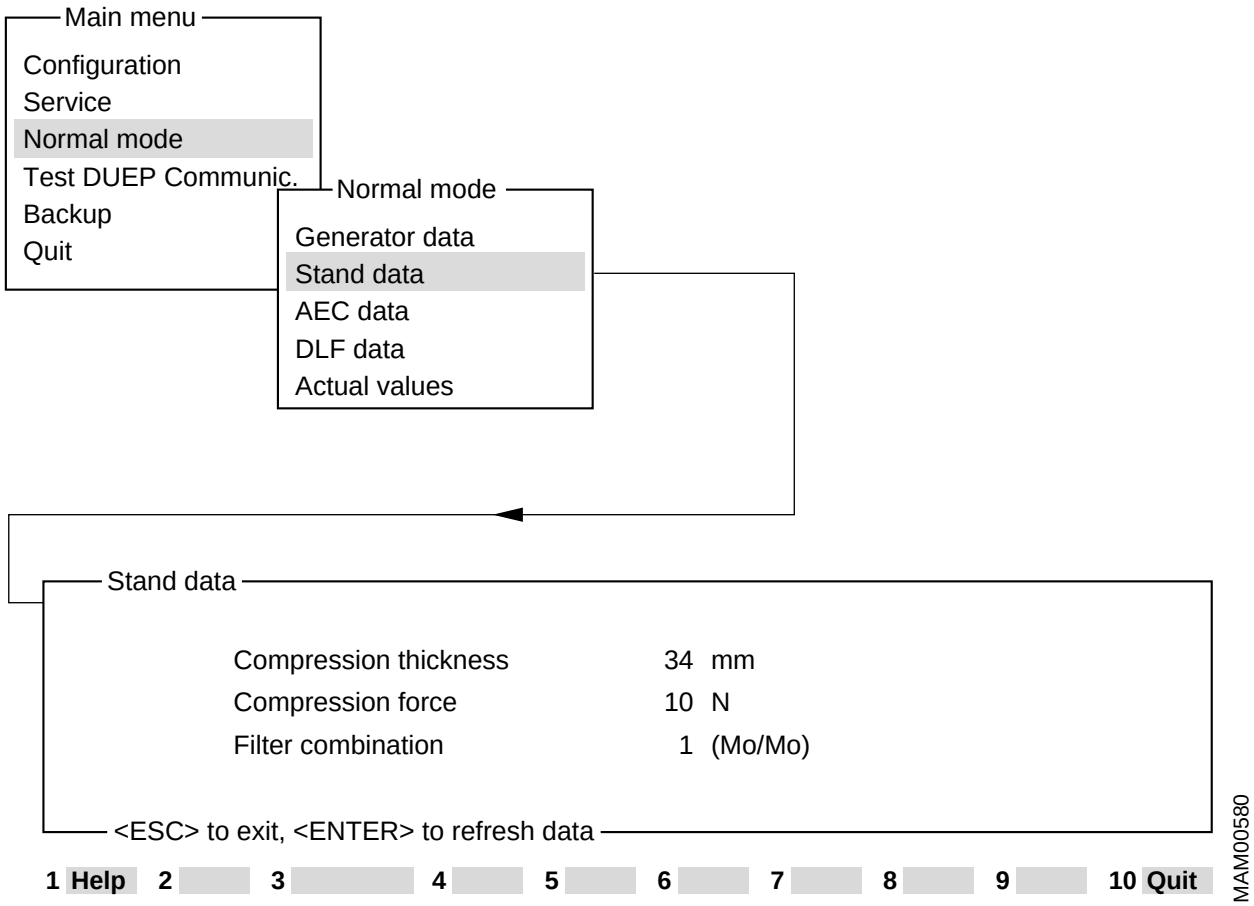


Fig. 42

Compression thickness

Shows object thickness at last compression.

Compression force

Shows the force at last compression.

Filter combination

Shows the chosen anode/filter combination on the control panel.

AEC data

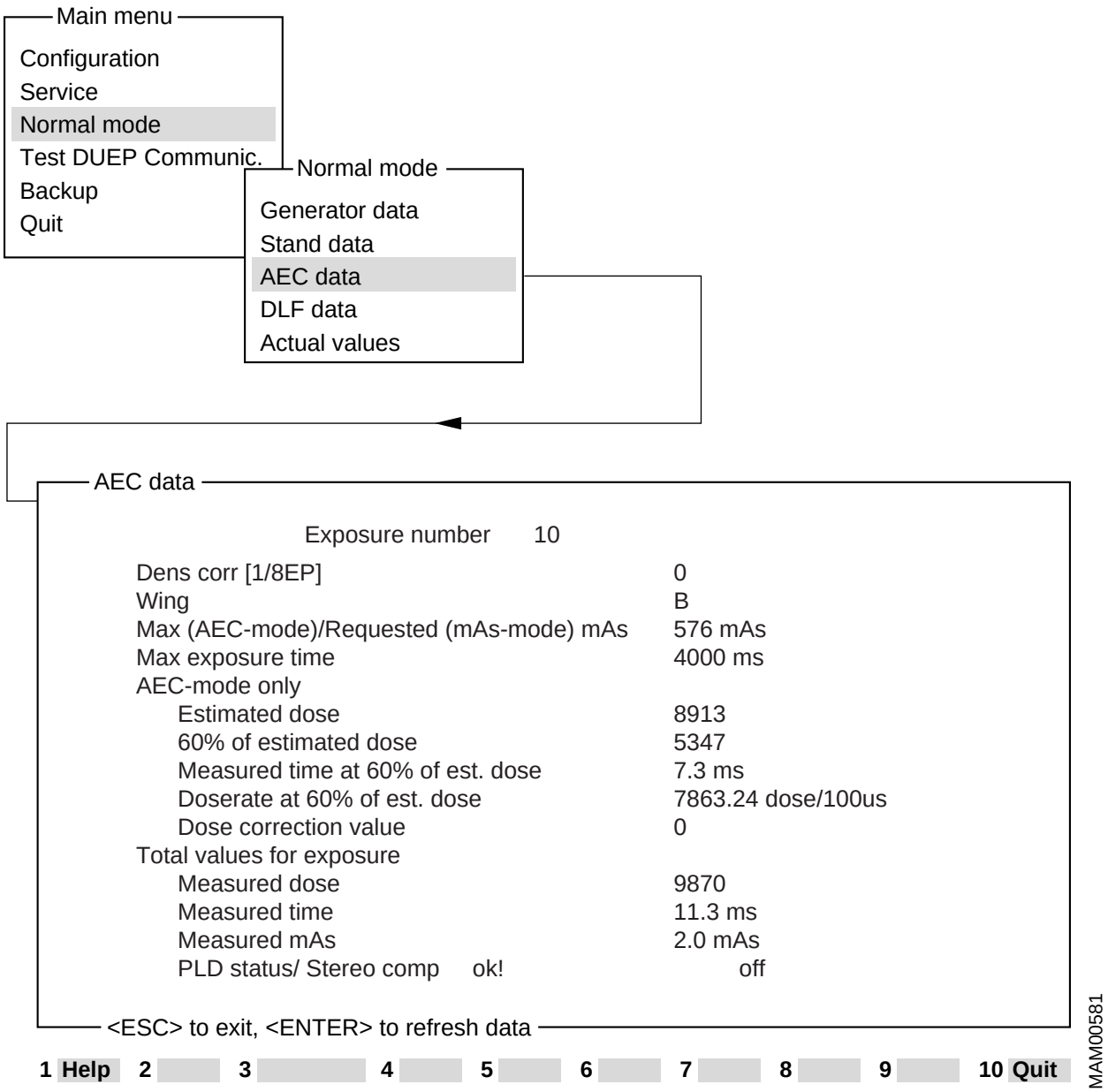


Fig. 43

This menu displays exposure data from the latest exposure. Pressing <ENTER> will update the exposure data.

Density correction

Displays the density correction value set on the control panel during exposure.

Wing

Indicates which wing is used. (Wing A = Wing 1, Wing B = Wing 2)

Max (AEC-mode)/Requested (mAs-mode) mAs

Shows the maximum mAs-value in AEC-mode and requested mAs-value in mAs-mode.

Maximum exposure time

Shows the maximum exposure time allowed for selected operating mode.

Estimated dose

A precalculated value for total required dose for the exposure.

60% of estimated dose

60% of the precalculated value for total estimated dose for the exposure

Measured time at 60% of est. dose

Time measured when 60% of test dose has been detected.

Dose rate at 60% of est. dose

60% of estimated dose divided by measured time at 60% of estimated dose.

Dose correction value

Displays the correction value used during exposure and measured in pulses. The correction value is determined by comparing dose rate with values in the AEC correction table.

Measured dose

Displays the total dose, measured in pulses.

Measured time

Displays the total time for the exposure.

Measured mAs

Displays the value of measured mAs during the exposure.

PLD status

In case an error is reported from the PLD-circuit of the AEC an error message will appear. Normally “Ok!” is shown.

Stereo comp

If an exposure has been performed with a biopsy unit mounted and the tube head positioned in stereo angle this will be indicated by “ON”. A compensation is made in the AEC if stereo mode is “ON”, to compensate for differing radiation conditions due to the stereo angle.

DLF data

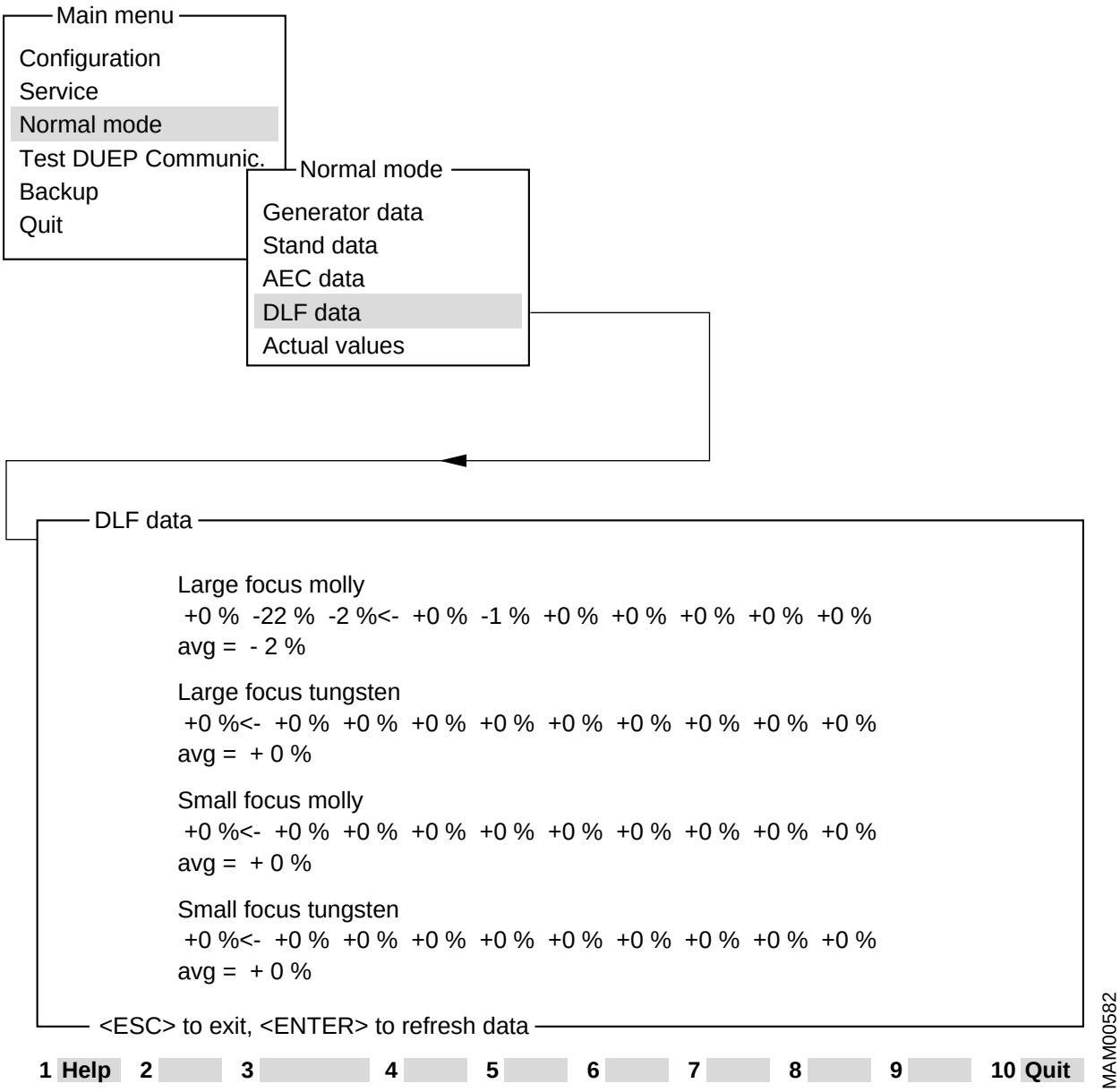

Main menu
Configuration
Service
Normal mode
Test DUEP Communic.
Backup
Quit
Normal mode
Generator data
Stand data
AEC data
DLF data
Actual values
DLF data
Large focus molly
+0 % -22 % -2 %<- +0 % -1 % +0 % +0 % +0 % +0 % +0 %
avg = - 2 %
Large focus tungsten
+0 %<- +0 % +0 % +0 % +0 % +0 % +0 % +0 % +0 % +0 %
avg = + 0 %
Small focus molly
+0 %<- +0 % +0 % +0 % +0 % +0 % +0 % +0 % +0 % +0 %
avg = + 0 %
Small focus tungsten
+0 %<- +0 % +0 % +0 % +0 % +0 % +0 % +0 % +0 % +0 %
avg = + 0 %
<ESC> to exit, <ENTER> to refresh data
1 Help 2 3 4 5 6 7 8 9 10 Quit
MAM00582

Fig. 44

This menu shows the percentage deviation between actual and desired tube current as well as the average deviation for the last ten exposures.

The arrow indicates the latest exposure.

Actual values

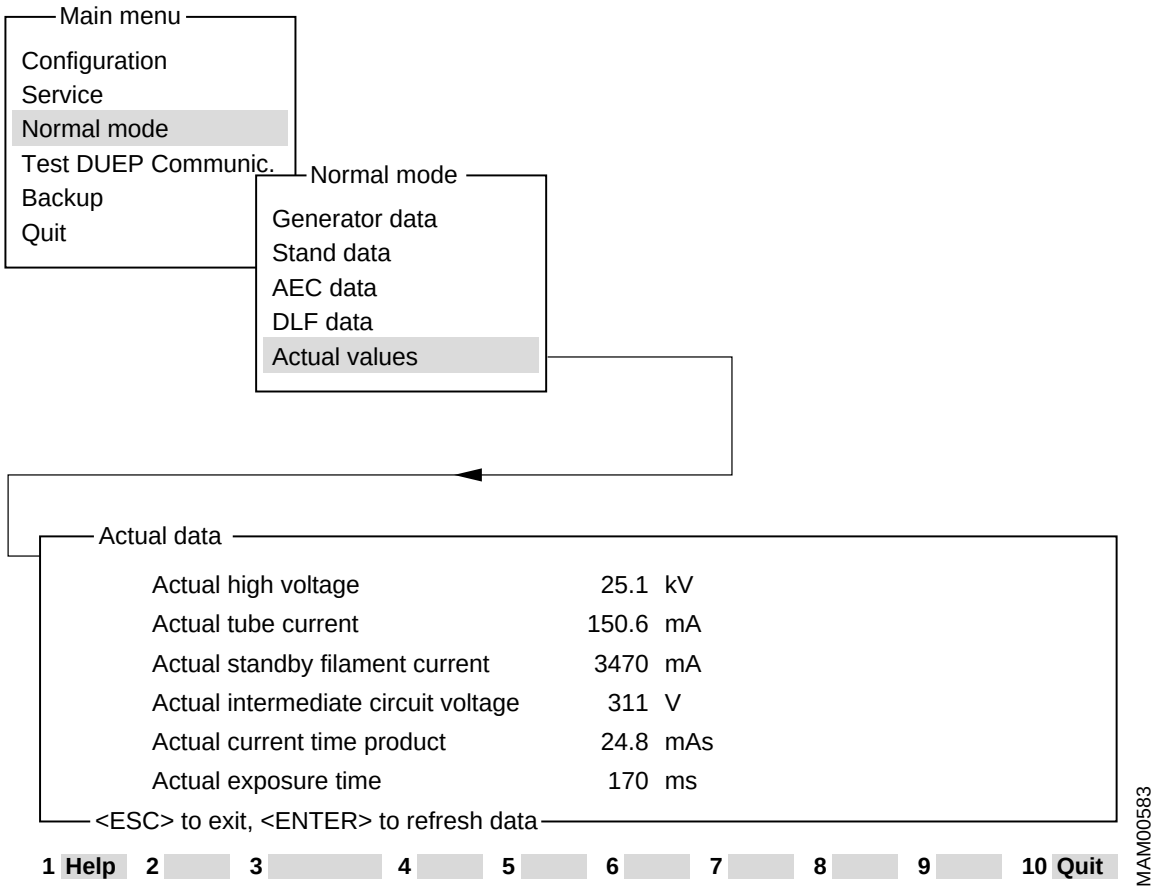


Fig. 45

Actual high voltage

Shows the actual kV at the start of the exposure.

Actual tube current

Shows the actual tube current at the start of the exposure.

Actual filament current

Shows the actual stand-by filament current.

Actual intermediate circuit voltage

Shows the intermediate circuit voltage applied at the start-up of the unit.

Actual current/time product

Shows the mAs value for the latest exposure.

Actual exposure time

Shows the exposure time for the latest exposure. The time may be 400-500 ms longer than the maximum exposure time in the AEC data menu, depending on tube current reduction and how the filament current is adapted.

Test DUEP Communication

NOTE	This function is only available with software V4.1.

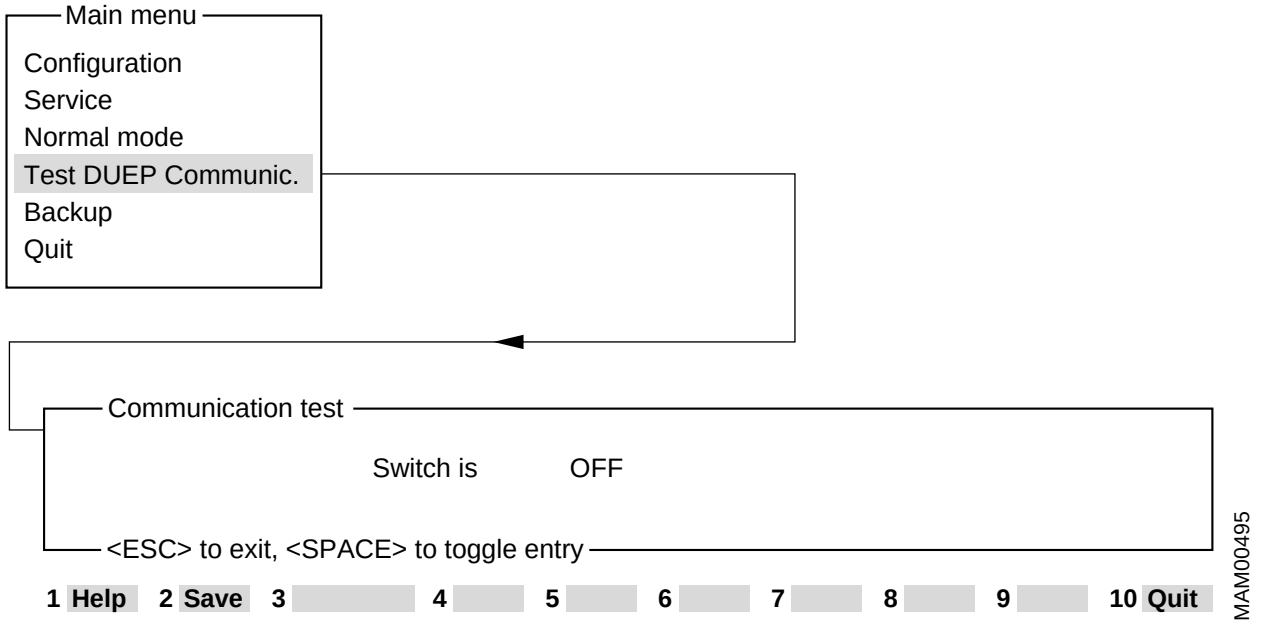


Fig. 46

The Test DUEP Communication menu alternative is used to trace internal messages between generator, panel AEC and stand.

Press F2 to switch test on. Received messages are shown.

Press F2 to switch test off.

Press F2 to show messages or space+F2 to hide them.

Press space+F2 to store messages to the file C:messages.txt or F2 not to store them.

Backup

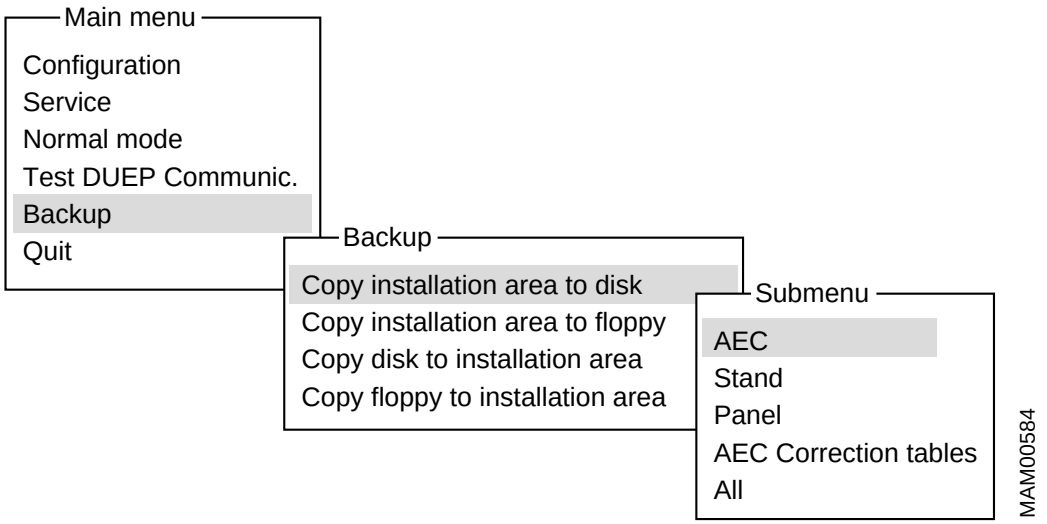


Fig. 47

This menu is used for handling different backup alternatives.

Copy installation area to disk/floppy

Will copy installation parameters for the item(s) chosen in the submenu, from the MAMMOMAT to file(s) on hard disk/floppy (C:/A:).

Type of parameters	Name of file
AEC	a_backup.txt
Panel	p_backup.txt
Stand	s_backup.txt
AEC Correction tables	momo_h.txt momo_d.txt morh_h.txt morh_d.txt wrh_h.txt wrh_d.txt

Copy disk/floppy to installation area

Will copy installation parameters for the item(s) chosen in the submenu(s) from file(s) on hard disk/floppy (C:/A:) to the MAMMOMAT.

Backup procedure in Windows® 2000 Pro

The floppy drive (drive A:) handling in the backup functionality of the Service Program is not compatible with Windows® 2000 Pro. In Windows® 2000 Pro, the Service Program fails to detect a diskette in the floppy drive and therefore cannot write or read backup directly from the floppy drive. The following instructions describes how to solve these problems.

Copy installation area to disk/floppy

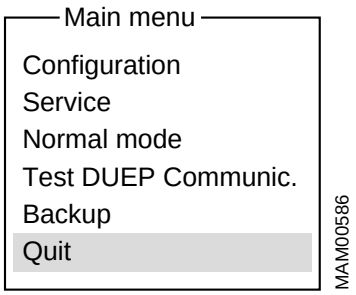
1. Open an MS-DOS or command prompt window.
2. Execute command "CD \"
3. Execute command "MKDIR mammomat"
4. Execute command "CD mammomat"
5. Insert the Service Program diskette into drive A:
6. Execute command "A:"
7. Start the Service Program as described in chapter 1
8. In the Service Program, choose "Copy installation area to disk"
9. Exit the Service Program
10. In the MS-DOS or command prompt window, execute command "C:"
11. Insert an empty diskette (the backup diskette) into drive A:
12. Execute command "COPY *.TXT A:"
13. Execute command "DEL *.TXT"
14. Execute command "CD.."
15. Execute command "RMDIR mammomat"
16. Close the MS-DOS or command prompt window

Copy disk/floppy to installation area

1. Open an MS-DOS or command prompt window.
2. Execute command "CD \"
3. Execute command "MKDIR mammomat"
4. Execute command "CD mammomat"
5. Insert the backup diskette into drive A:
6. Execute command "COPY A:*.TXT"
7. Replace the backup diskette with the Service Program diskette into drive A:
8. Execute command "A:"
9. Start the Service Program as described in chapter 1
10. In the Service Program, choose "Copy disk to installation area"
11. Exit the Service Program
12. In the MS-DOS or command prompt window, execute command "C:"

13. Execute command "DEL *.TXT"
14. Execute command "CD.."
15. Execute command "RMDIR mammomat"
16. Close the MS-DOS or command prompt window

Quit



<Exit> the Service Program. <F10> can also be used.

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Enable/Disable Dose Calculation

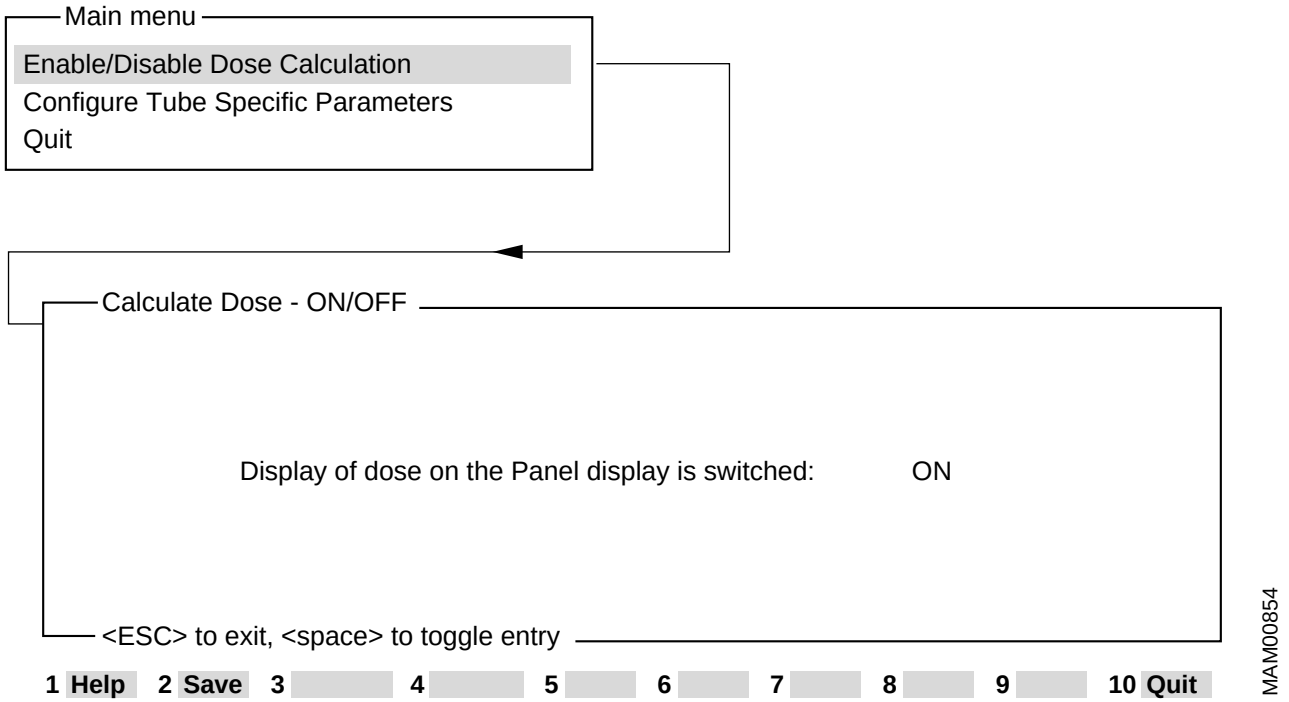
Main menu
Enable/Disable Dose Calculation
Configure Tube Specific Parameters
Quit
Calculate Dose - ON/OFF
Display of dose on the Panel display is switched: ON
<ESC> to exit, <space> to toggle entry
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00854

Fig. 1

To show calculated dose values on the control console, enable this option (ON). The dose will be showed in the mAs/mGy display (Fig. 2), the value shown will shift from mAs to dose with app. 2 second intervals.

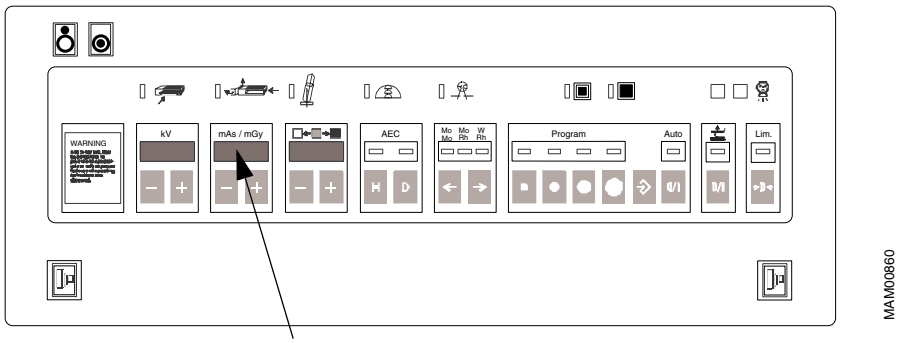

Fig. 2 mAs / mGy value

NOTE	**Selecting "OFF" will only prevent dose values from showing in the mAs/mGy display. Dose calculations will still be performed, and will show on print if the printer option is installed.**

Configure Tube Specific Parameters

HVL values

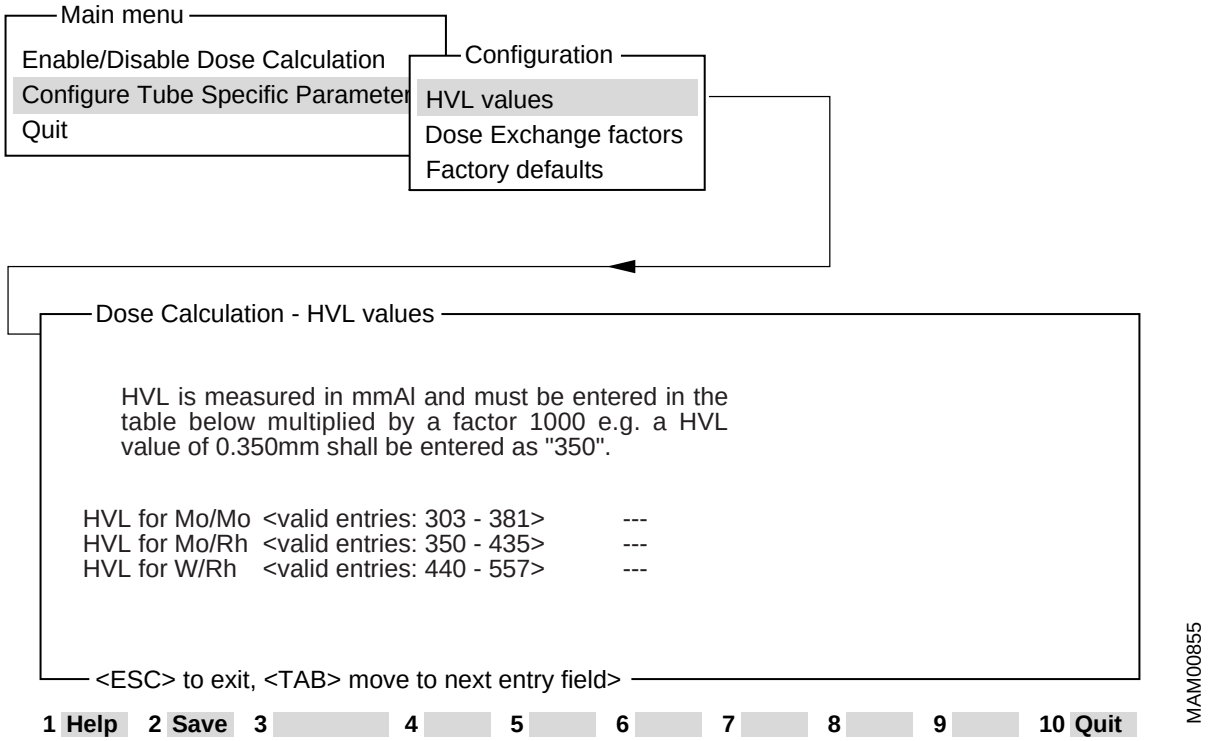

Fig. 3

If the HVL values have been measured, enter the correct values. HVL values are entered for each anode/filter combination. The option "Factory defaults" will set standard values.

Dose Exchange factors

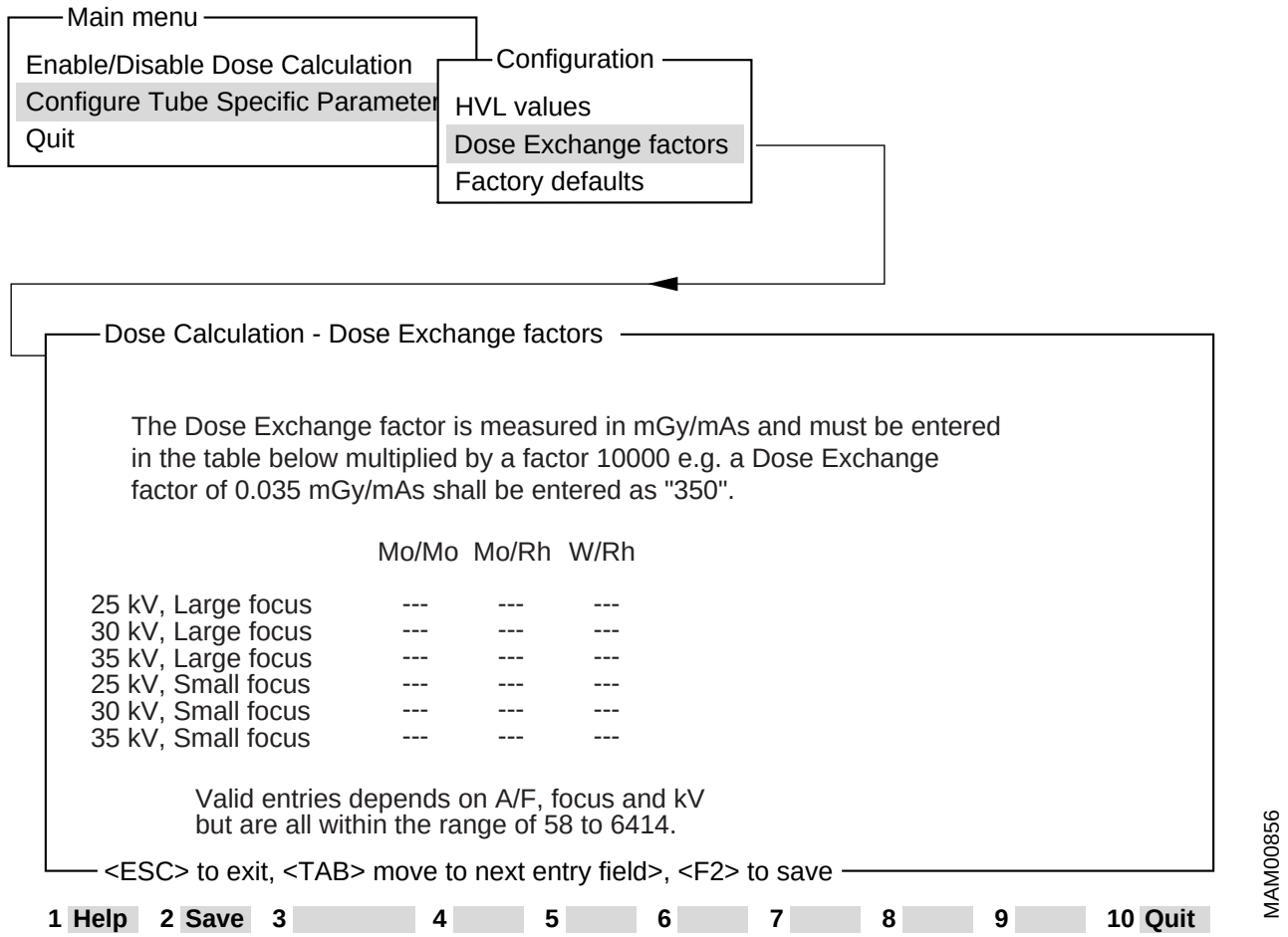
Main menu
Enable/Disable Dose Calculation
Configure Tube Specific Parameter
Quit
Configuration
HVL values
Dose Exchange factors
Factory defaults
Dose Calculation - Dose Exchange factors
The Dose Exchange factor is measured in mGy/mAs and must be entered in the table below multiplied by a factor 10000 e.g. a Dose Exchange factor of 0.035 mGy/mAs shall be entered as "350".
Mo/Mo Mo/Rh W/Rh
25 kV, Large focus --- --- ---
30 kV, Large focus --- --- ---
35 kV, Large focus --- --- ---
25 kV, Small focus --- --- ---
30 kV, Small focus --- --- ---
35 kV, Small focus --- --- ---
Valid entries depends on A/F, focus and kV but are all within the range of 58 to 6414.
<ESC> to exit, <TAB> move to next entry field>, <F2> to save
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00856

Fig. 4

If the dose exchange factor has been measured, enter the correct values. The option "Factory defaults" will set standard values.

Factory defaults

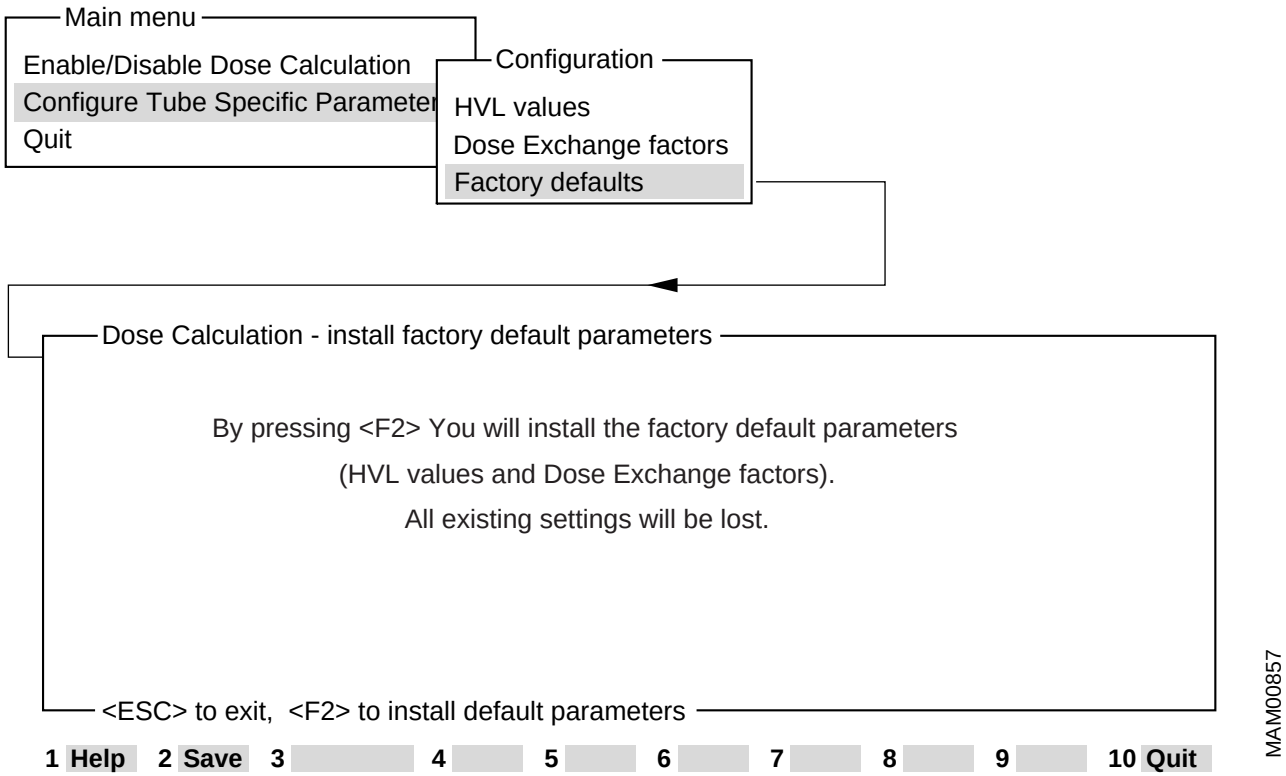
Main menu
Enable/Disable Dose Calculation
Configure Tube Specific Parameter
Quit
Configuration
HVL values
Dose Exchange factors
Factory defaults
Dose Calculation - install factory default parameters
By pressing <F2> You will install the factory default parameters
(HVL values and Dose Exchange factors).
All existing settings will be lost.
<ESC> to exit, <F2> to install default parameters
1 Help 2 Save 3 4 5 6 7 8 9 10 Quit
MAM00857

Fig. 5

This option describes how to install the factory default parameters.

When installing factory default parameters all previously entered data (HVL values and Dose exchange factors) will be lost.

Quit

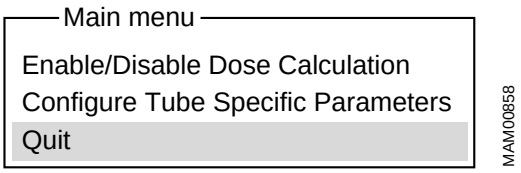

Fig. 6

Exit the dose calculation program. <F10> can also be used.

Error messages of the master Er 0XX

Er 004
“Communication master - AEC faulty”

Displayed on PC: Communication master <-> AEC disturbed or AEC not ready

Description

If the master processor (D702) cannot activate the AEC processor (D701) via the serial interface any more, or if any important data from the control deck is missing, the above mentioned error is displayed.

Fault elimination

First you must check if PC board D701 is plugged in correctly and if the connections to the power supply and to the serial interface (see wiring diagram) function correctly.

If no fault can be found, PC board D701 or D702 should be replaced.

Er 005
“Flash in AEC is defective or not correctly initiated.”

Displayed on PC: Flash in AEC is defective or not correctly initiated

Description

During initialization, the AEC processor (D701) checks the data stored in its E^2PROM by means of stored check sums. If these data are incorrect or if the E^2PROM fails, the AEC processor informs the master processor via the serial interface and the above mentioned error is displayed.

The master also generates this error if, during exposure release, no communication with the AEC has been established yet.

NOTE	**As opposed to this, error 004 appears if communication started with the master is disturbed.**

Fault elimination

Reprogram E2PROM or replace E2PROM or PC board D701. Reprogram with the service PC, menu Backup.

Er 008
“Stand not ready”

Displayed on PC: Communication master <-> stand disturbed or stand not ready

Description

This error means that the communication between master processor and unit processor via the serial interface is faulty or interrupted.

Fault elimination

Check if the power supply and the serial interface (see wiring diagram) to the unit function correctly.

Er 011

"Exposure has been stopped"

Displayed on PC: Exposure aborted by user

Description

If the exposure buttons are released prematurely, the exposure is aborted immediately. On the control deck, the LIMIT LED (→0←) lights up, an acoustic signal sounds and the above-mentioned error is displayed.

Fault elimination

This error indication is only for information and requires no further action. Should it appear frequently, however, check the contacts of the exposure release buttons. Replace exposure release button(s), if necessary.

Er 012
"Time limit reached"

Displayed on PC: Time limit reached

Description

In order to prevent the tube assembly from overload, a timer runs during exposure. This is set with the time limit before exposure. If this timer runs down, the exposure is aborted immediately, and the above error message is displayed. Depending on the mode of operation, the time limit is calculated as follows:

AEC mode

The time limit is the power-dependent load time plus a tolerance value (approx. 400 ms).

mAs mode

The time limit is the calculated exposure time plus a certain reserve. If this period is shorter than 2 s, 2 s are assumed. If it exceeds 2 s, a reserve of 400 ms is added.

The time limit can be read off in ms with the service PC in "normal mode" under item "AEC data". The value shown here does not include the extra 400 ms.

Fault elimination

The tube current and the filament current must be measured again with the oscilloscope (test points I_{ROE} and I_H on D705). The nominal and actual value of the tube current can be read off with the service PC in normal mode. If the actual tube current is too low, you must first ensure that the dynamic learn filament current (DLF switch) is switched on. The tube must be readjusted in any case. Should difficulties still occur, the tube-current actual value acquisition must be checked (see wiring diagram).

Er 013
“Limit mAs during AEC exposure”

Displayed on PC: mAs limit reached in AEC exposure

Description

For safety reasons, with AEC exposures, the accumulated mAs is integrated via the timer independently of the AEC. If a focus, tube assembly and kV-dependent time limit (see table) is obtained without the AEC being switched off, the exposure is aborted and the above-mentioned error message is displayed.

Tube assembly	25 kV	30 kV	35 kV
P40 MoW-100G F1	196 mAs	163 mAs	140 mAs
P40 MoW-100G F2	600 mAs	500 mAs	428 mAs
P40 MoW-100G F3	238 mAs	198 mAs	170 mAs
P40 MoW-100G F4	752 mAs	627 mAs	537 mAs

Fault elimination

The dose signal must be checked from the detector or the chamber to the hardware of the AEC (see wiring diagram).

If no error can be detected, PC board D701 or D702 must be replaced.

Er 014
“Corrected kV value out of range”

Displayed on PC: kV corrected for dose calculations is out of range

Description

The kV value used for the glandular dose calculations is the "set kV" adjusted for the actual HVL value of the tube. This corrected kV value is outside the limits of the lookup tables used for the glandular dose calculations. *Er 014 is valid only for SW 4.4 or higher.*

Fault elimination

Reload the tube specific HVL values with the help of the "dose calculation configuration program".

Er 020
“PC mess bad length”

Displayed on PC: PC message had bad length

Description

The length of the message, sent from the service PC to the MAMMOMAT, is too long.

Fault elimination

Check that the right version of the service program is used.

Er 021
“PC dsr lost”

Displayed on PC: PC data set ready lost

Description

This error message is not enabled today.

Fault elimination

Er 022
“PC rx error”

Displayed on PC: Receive message from PC failed.

Description

An error occurred when the MAMMOMAT was receiving data from the PC or printer.

Note: May occur if the printer is switched on/off while the rest of the system is powered.

Fault elimination

Check the cables and connectors to the PC or printer. Board 702 defective. PC/Printer defective.

Er 023
“PC tx error”

Displayed on PC: Transmit message to PC failed.

Description

An error occurred when the MAMMOMAT tried to send data to the service PC or printer.

Fault elimination

Check the cables and connectors to the PC or printer. Board 702 defective. PC/Printer defective.

Er 024
“PC time-out”

Displayed on PC: PC, ID camera or work station has not sent ACK/NAK within two seconds. Three tries are made.

Description

The service PC didn’t answer.

Fault elimination

Check the cables and connectors to the PC. PC defective.

Er 025
“PC NAK”

Displayed on PC: PC, ID camera or work station sends NAK three times as response to the same message.

Description

The Service PC did not receive information from Master. Time-out occured and Service PC responds with NAK.

Fault elimination

1. Reset error on panel and try again.
2. Reset MAMMOMAT and PC.

Error messages of the panel Er 1XX

Er 105
“Incorrect check sum in the E^{2}PROM”

Displayed on PC: Checksum error in installation data stored in panel EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the installation area in the E^{2}PROM on the control deck are checked with a shadow area also stored in the E^{2}PROM. If any discrepancy was detected, the above mentioned error is displayed.

Fault elimination

The installation data can be corrected by means of the service PC. If this error appears more frequently, exchange the deck PC board D740 and make a new installation of the parameters in the control panel. The opdose parameters have to be programmed manually via the control deck. For the rest of the parameters, use the service PC, menu Backup.

Er 106
“E^{2}PROM program area error”

Displayed on PC: EEPROM program area error

Description

When data is stored in the E^{2}PROM (D740 I12) of the control panel during programming of the opdose parameters, this is read back once more to check whether it has been stored correctly. If any differences occur, the above-mentioned error is displayed.

Fault elimination

The E^{2}PROM (D740 I12) in the panel must be replaced. If the error still occurs, the whole D740 must be replaced. In both cases a new installation of the parameters in the control panel has to be performed. The opdose parameters have to be programmed manually via the control deck. For the rest of the parameters, use the service PC, menu Backup.

Er 107
“Deck in STAND ALONE mode on exposure release”

Displayed on PC: No communication panel ↔ master

Description

If no data transmission takes place between the deck and the master during the first 20 s after power on, the control deck switches to the so-called “stand alone” mode. The keyboard can be operated normally. If the exposure release button is operated in this mode, the above mentioned error message is shown on the display.

Fault elimination

The cause of this error can be an interruption on the serial interface to the master. For this reason, this connection must be checked exactly.

Error messages of the filament Er 3XX

Er 302
“Filament current monitoring I_{Hmin} has responded.”

Displayed on PC: I_{Hmin}- filament current too low at standby

Description

During “Stand-by”, the master checks whether there is any filament current. If the filament current does not reach a predetermined value, the above-mentioned error is displayed.

Fault elimination

Check fuse F3 on T2 (see wiring diagram).
Check X8 connector (both on board D700 and on the cable).
Check filament wires.

Filament of tube assembly defective.
PC board D705 defective.

Error messages of the AEC Er 4XX

Er 401
“Error during configuration of PLD.”

Displayed on PC: Error during configuration of PLD.

Description

Configuration of PLD device in AEC failed.

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Start up the MAMMOMAT. If the error occurs again change D701 circuit board.

Er 402
“Self-test of PLD failed.”

Displayed on PC: Self-test of PLD failed.

Description

Gain-test of circuit board D701 failed.

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Start up the MAMMOMAT. If the error occurs again change D701 circuit board.

Er 403
“Self-test time-out. Fatal error in PLD’s internal program.”.

Displayed on PC: Self-test time-out. Fatal error in PLD’s internal program.

Description

Time-out occurred in the PLD device in AEC during gain-test of circuit board D701.

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Turn on the MAMMOMAT. If the error occurs again change D701 circuit board.

Er 406
“PLD cannot perform requested operation because it is busy self-testing.”

Displayed on PC: PLD cannot perform requested operation because it is busy self-testing.

Description

PLD in AEC cannot perform requested operation because it is busy self-testing.

Fault elimination

Acknowledge displayed error and wait approx. one minute.

Er 407
“Time-out error while erasing AEC flash memory”

Displayed on PC: Time-out error while erasing AEC flash memory

Description

The D701 contains a memory device called “flash memory”. This memory is used for storing AEC parameters and correction tables. Before writing data into the memory it is first necessary to erase the sector in which data is to be stored. The erasing procedure is controlled by a timer. If anything goes wrong while erasing AEC flash memory and time-out occurs, this will result in an error .

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Start up the MAMMOMAT. If the error occurs again change D701 circuit board.

Er 408
“Time-out error while writing to AEC flash memory (time-out in waiting for OK indication).”

Displayed on PC: Time-out error while writing to AEC flash memory (time-out in waiting for ok indication).

Description

The D701 contains a memory device called “flash memory”. This memory is used for storing AEC parameters and correction tables. The procedure of writing this data is controlled by a timer. If anything goes wrong while writing to the AEC flash memory and time-out occurs, this will result in an error.

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Start up the MAMMOMAT. if the error occurs again change D701 circuit board.

Er 409
“AEC flash test has locked up (time-out of 15 seconds exceeded).”

Displayed on PC: AEC flash test has locked up (time-out of 15 seconds exceeded).

Description

During start-up of the unit the AEC performs a number of tests, e.g. testing of the flash memory device on D701. This testing is controlled by a timer and if something turns out to be wrong a time-out is generated.

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Start up the MAMMOMAT. If the error occurs again change D701 circuit board.

Er 410
“Attempt to start an exposure before AEC flash memory has delivered correction values.”

Displayed on PC: Attempt to start an exposure before AEC flash memory has delivered correction values.

Description

Before an AEC exposure is released, and based on the exposure settings on the panel, the AEC fetches an estimated dose from a correction table stored in the flash memory. If the exposure buttons are pressed during reading from flash, an error will occur.

Fault elimination

Acknowledge displayed error. Wait 15 seconds. Try to perform an exposure.

Er 412
“Attempt made to start an exposure while self-testing of the PLD in AEC was in progress”

Displayed on PC: Attempt made to start an exposure while self-testing of the PLD in AEC was in progress.

Description

Attempt made to start an exposure while self-testing of the PLD in AEC was in progress.

Fault elimination

Acknowledge displayed error. Wait 15 seconds. Try to perform an exposure.

Er 413
“Exposure too short, correction value could not be loaded in time.”

Displayed on PC: Exposure too short, correction value could not be loaded in time.

Description

An estimated dose is pre-calculated before an exposure is released. The minimum estimated dose is defined for a minimum object thickness. For a normal object thickness (> 5 mm) the AEC will calculate a necessary correction to add to the estimated dose during the exposure. This procedure takes a while, and for very thin objects it is possible that the AEC will not manage to, within the time limit, decide if a correction is necessary or not. This will result in a error, due to small object thickness.

Fault elimination

Acknowledge displayed error. Change exposure parameters (e.g. lower kV).

Er 414
“Attempt to release an exposure after the PLD in AEC has failed self-test configuration.”

Displayed on PC: Attempt to release an exposure after the PLD in AEC has failed self-test/ configuration.

Description

Caused by previously generated errors 401, 402, 403, 409 and not restarted MAMMOMAT.

Fault elimination

Switch off the MAMMOMAT. Wait approx. one minute. Start up the MAMMOMAT. If the error occurs again change D701 circuit board.

Er 416
“Estimated dose out of range.”

Displayed on PC: Estimated dose out of range.

Description

Estimated dose out of range, which can be caused by

- extreme setting of sensitivity
- extreme setting of sensitivity correction
- extreme setting of density correction.

This means that the exposure will be eliminated by the max. mAs limit.

Fault elimination

Acknowledge displayed error. Make sure the correct AEC Correction tables are installed. Check settings of sensitivity, sensitivity correction and density correction.

Er 418
“Attempt to make offset compensation test while in AEC mode.”

Displayed on PC: Attempt to make offset compensation test while in AEC-mode.

Description

During an offset compensation test the AEC board is set in a special test mode and cannot perform an AEC exposure. Because of this, the test exposures have to be performed in mAs mode during this test.

Fault elimination

Acknowledge displayed error. Change to mAs and follow the instructions for offset compensation test correctly.

Er 419
“Attempt to write to registers of PLD not available during exposure.”

Displayed on PC: Attempt to write to registers of PLD not available during exposure.

Description

This is an internal error not interfering with an exposure and not shown on the control panel.

Fault elimination

If this error is discovered during reading of the error buffer through service PC, please report this immediately.

Er 420
“Dose or time monitor overflow in PLD.”

Displayed on PC: Dose or time monitor overflow in PLD.

Description

This is an internal error not interfering with an exposure and not shown on the control panel. Time and dose values reported by the service PC are not valid.

Fault elimination

If this error is discovered during reading of the error buffer through service PC, please report this immediately.

Er 421
“Wrong test mode request received by PLD.”

Displayed on PC: Wrong test mode request received by PLD.

Description

This is an internal error not interfering with an exposure and not shown on the control panel.

Fault elimination

If this error is discovered during reading of the error buffer through service PC, please report this immediately.

Er 422
“Attempt to read registers of PLD not available during exposure.”

Displayed on PC: Attempt to read registers of PLD not available during exposure.

Description

This is an internal error not interfering with an exposure and not shown on the control panel.

Fault elimination

If this error is discovered during reading of the error buffer through service PC, please report this immediately.

Er 423
“Counters for estimated doses in PLD not initialized in time.”

Displayed on PC: Counters for estimated dose in PLD not initialized in time.

Description

If mAs mode: Internal error not interfering with an exposure and not shown on the control panel.
If AEC mode: Internal error interfering with an exposure and shown on the control panel.

Fault elimination

If mAs mode: If this error is discovered during reading of the error buffer through service PC, please report this immediately.
If AEC mode: Acknowledge displayed error. Wait 15 seconds. Try to perform an exposure.

Er 450
“Exposure aborted by dose monitoring.”

Displayed on PC: Exposure aborted by dose monitoring.

Description

An AEC exposure could not be performed due to too low detected dose rate.

Fault elimination

Acknowledge displayed error. Change exposure parameter settings (e.g. higher kV).

Error messages of the power pack Er 6XX

Er 601
“Rotation not reached”

Displayed on PC: Rotation speed not reached within 3 s

Description

During starting of the rotating anode, the master counts the control pulses and compares them with a ‘tube assembly and intermediate circuit voltage’-dependent table value. If this is not reached within 3 s, Er 601 is displayed.

Fault elimination

BS signal missing (see wiring diagram).
Actuation of WRANST 2 fails (see wiring diagram).
Check oscillation current (see wiring diagram).
Rotating anode cable or stator defective.

Er 602
“Tube voltage < 17 kV”

Displayed on PC: kV_{min} - minimum tube voltage 17kV not reached

Description

If 17 kV is not reached within 250 ms after the KVE signal, the above-mentioned error is displayed (LED V39 on D705 lights up).

Fault elimination

Intermediate circuit voltage too low (see wiring diagram).
Tube current or power too high.
Check oscillation current (see wiring diagram).
Actuation of WRANST 1 or WRANST 2 fails (see wiring diagram).
SS relay not pulled up (see wiring diagram).
“kV_{nom}” too low.
Board D702, D705 or D710 defective.

Er 603
“Tube voltage > 50 kV”

Displayed on PC: kV_{max} - tube voltage greater than 50kV

Description

A threshold switch in the kV controller watches during exposure whether the high voltage exceeds 50 kV. If this is the case, the exposure is aborted immediately via the KVA lead. The error is indicated by LED “> 50 kV_{ST}” (D705.V41) lighting up and the above mentioned error message.

Fault elimination

Check kV nominal value. Check tube current and power. Actual value acquisition defective (see wiring diagram). Replace PC board D705.

Er 604
“WR blank is applied”

Displayed on PC: WR_AUSTAST - inverter short circuit blanking signal remains

Description

When I_{max} in the inverter is exceeded, the control is interrupted for 200 ms. The software then checks whether the blanking signal is still applied. If this is the case, the above mentioned error is displayed.

Fault elimination

Replace PC board D705.

Er 605
“Module current too high during rotary anode acceleration”

Displayed on PC: Inverter short circuit during anode rotation boost

Description

If the I_{max} monitoring responds during acceleration of the rotating anode, the above mentioned error is displayed.

NOTE	**If this occurs, the system has to be switched off and restarted in order to get out of the error state.**

Fault elimination

Transistor module in inverter defective.
Stator short-circuit.
Board D705 or D710 defective.

Er 606
“Module current too high during exposure”

Displayed on PC: Inverter short circuit during radiation

Description

Same as Er 605, but the error is displayed only after the monitoring has responded three times.

NOTE	**If this occurs, the system has to be switched off and restarted in order to get out of the error state.**

Fault elimination

Tube “surges”.
High-voltage cable defective.
Board D705 or D710 defective.

Er 607
“Module current too high during braking”

Displayed on PC: Inverter short circuit during brake cycle

Description

Same as Er 605.

NOTE	**If this occurs, the system has to be switched off and restarted in order to get out of the error state.**

Fault elimination

Transistor module in inverter defective.
Check oscillation current (see wiring diagram).
Rotating anode cable or stator defective.
Board D705 or D710 defective.

Er 608
“No CNT pulses”

Displayed on PC: No CNT pulses during anode rotation boost

Description

Master D702 monitors during acceleration of the rotating anode whether there are any CNT pulses. If this is not the case, the above-mentioned error is displayed.

Fault elimination

Rotating anode cable defective
High impedance in stator.
Board D705 or D702defective.

Er 609
“UZ_{min} intermediate circuit voltage < 180 V”

Displayed on PC: U_{Zmin} - intermediate circuit voltage too low

Description

Master D702 measures the intermediate circuit voltage. If this is < 180 V, the above-mentioned error is displayed.

Fault elimination

Check fuses F8, F9 for D711(see wiring diagram).
Check connections X83 and X86.
Board D711 defective.
Monitoring on PC board D702, D705 or D710 defective.

Er 611
“KVA is missing during exposure”

Displayed on PC: KVA signal disabled during radiation

Description

During exposure, KVA becomes “H” and the inverter is thus enabled. If this enabling fails, the above-mentioned error is displayed.

Fault elimination

Check KVA lead (see wiring diagram).
Board D701, D702 or D705 defective.

Er 620
“UCTRL is missing”

Displayed on PC: U_{anst} +15V to control inverter not present

Description

Master D702 monitors the control voltage of the transistor module in the inverter (+ 15V). If this voltage fails, the above-mentioned error is displayed.

Fault elimination

Fuse F5 defective (see wiring diagram).
Measure voltage on T2.
Board D702 or D710 defective.

Er 630
“Pressure switch PH1 has responded”

Displayed on PC: PH1 pressure switch on the HV tank activated

Description

PH1 pressure switch on the HV tank is activated, the above-mentioned error is displayed.

Fault elimination

Overload of the tube assembly or of Hl.
Line interruption (see wiring diagram).
Board D702 defective (monitoring).

Error messages of the stand Er 8XX

Er 801
“AR is not released”

Displayed on PC: Time-out of AR signal

Description

The processor generates the above mentioned error, if enabling of stand fails.

Fault elimination

Check whether VH is transmitted (see wiring diagram).

Does the green LED V2 (AR) on PC board D702 light up (see wiring diagram)?

Yes: Board D702 defective.
No: Check stand.
Grid does not run.

Er 802
“OKT 2 has responded”

Displayed on PC: OKT2 pressure switch on tube housing or beam form anode or door switch

Description

Same as Er 630 (PH1 is replaced with OKT2, HV tank with tube housing).

Er 811
“Stand not ready for exposure”

Displayed on PC: Stand not ready for exposure

Description

Normally, the panel does not allow start of exposure, if any of the following errors is present: No object table installed, no film cassette inserted, or film cassette not exchanged after exposure, improper diaphragm mounted. Nor will it allow exposure, if the tube assembly is at a collision endangered distance to the floor. These operator errors are indicated on the control panel (the LED at the corresponding symbol lights up). Should the control panel nevertheless allow start of exposure, this might be due to a bit-error during the transmission of data between the stand and the control panel. As a precautionary measure, the stand also checks whether the conditions are fulfilled. If this is not the case, error message 811 will be generated.

Fault elimination

Switch off the equipment and then switch it on again.

Er 812
“Compression Protect Error”

Displayed on PC: Compression protect switch not OK in stand

Description

This signal is used to check the proper operation of the compression protect relay (Kl) on the motor board (D802). The CPU (D801) reads the signal after a short delay after releasing the compression pedal in order to check that the relay has opened and disabled motor running in the compression direction. Note that the test point on D802 is protected with 4,75k.

Fault elimination, trouble shooting

Normal active level 9V (test point COMP_PROT on D802). If the level is OV check 14V and Kl on the motor board or look for short circuit on the ribbon cable between D801 and D802. If the cable is OK, D802 should be replaced.

If the voltage is 18V on the test point, the ribbon cable is open or D801 faulty.

If the voltage is OK replace D801.

Er 813
“Compression OK Error”

Displayed on PC: Compression Motor controller, or motor, error in stand

Description

This signal indicates an over current or lack of voltage (5V or 15V) in the compression motor drive. If over current, the signal appears after about 2 s and disappears after about 0,5 s. The signal causes D801 to stop sending pulses to the compression drive and thus disables the compression motor. The red LED “comp error”, V2 lights when error (comp_ok signal low) except if 5V is missing.There is no test point.

Fault elimination, trouble shooting

If V2 is lit steadily, check fuses F3 (24V) and F2 (24VF & l5V). l5V is indicated by LED V49 and can be measured at test point l5V on D802. Test point 24VF should measure about 30V unloaded. 5V is indicated by LED V7 and test point 5V on D802. If 5V and 14V (normally about 18V unloaded) are missing check Fl on D801. Missing voltages can also be caused by an open connection in Emergency Stop Switch S880.

Over current is most likely caused by a faulty motor, mechanical overloading of motorized movement, short-circuited wiring or D805 or faulty D802.

Er 815
“Compression Speed Error”

Displayed on PC: Compression speed too high, error suspected, in stand

Description

The CPU (D801) has detected compression speed greater than 13 cm/s. The software causes the compression motor to reverse direction.

Fault elimination, trouble shooting

This error can be caused by play in the compression unit, defective compression measurement hardware, or short-circuited power stage on the motor board. In the first two cases, replace the compression unit and re-calibrate the compression values with the service PC program. In the third case, the compression motor will run at max speed upwards except when a compression pedal is pressed. It is not certain that error 815 will appear. Replace D802.

Er 816
“Collimator move error”

Displayed on PC: Collimator fails to reach correct position in time

Description

This error occurs if it takes more than 8 s for the collimator plate to move from the 18x24 position to the 24x30 position, or vice versa.

At the two positions, the test point COLL_Pl at CPU board (D801) is high (5V), and in between it is low (0V). The test point value can also be read by the service program. “Stand tests/Switches” will show all switches, and the one that corresponds to COLL_Pl is named Collimator position 18x24.

Fault elimination, trouble shooting

Switch between 24x30 and 18x24 object tables and check if the collimator plate moves at all.

If it does not move:

- Check if the CPU sends out pulses, COLL_ST test point on D801, if not, replace D801.
- Check if the wing board (D805) receives pulses, test point COLL_ST on D805, if not check cables and connectors between D801 and D805.
- Check voltages on wing board 5V and 14V.
- Check STEP_ENABLE test point on D805, it should be low (0V) when pulses are output to the motor.
- Check if it is at an end position, and the direction is into the end. Direction test point COLL_D at D805 should be low (0V) when moving collimator towards the patient. If something is wrong, check cables and connectors.

If it moves:

- Check if the collimator position 18x24 light switch works as in the description above.
- Check if it moves the whole time of 8 s. If it does but apparently not reaches the other position in time, then something may be in the way that slows the speed down, or the motor may be faulty. In the last case, try changing the motor.
- If the motor stops after just a short time, either the motor or the wing board (D805) is faulty. Try replacing one of them.

Err 817
“Filter move error”

Displayed on PC: Filter fails to reach correct position in time

Description

The filter control function on CPU board (D801) will output stepper motor pulses until the new filter position can be sensed. The test point FILT P will show the status of filter position sensor. At any of the three filter positions FILT P will be low (0, 0V). A short distance from the position, in either direction, FILT P will be high (1, 5V). This remains for a certain number of stepper motor steps, different for the three filter positions, until there is a long part where FILT P is low again. The test point value can also be read by the service program. “Stand tests/Switches” will show all switches.

The error is displayed if no area where the FILT P sensor is high, for the chosen filter, can be found within a certain number of stepper motor steps.

Fault elimination, trouble shooting

Switch between the three anode/filter combinations on the control panel and check if the filter disc moves at all.

If it does not move:

- check if the CPU sends out pulses to the wing board, FILT ST test point on D805, if not, check cables and connectors between D801 and D805 and maybe replace CPU board (D801) or wing board (D805).
- check voltages on wing board, 5V and 14V.
- check STEP ENABLE test point on D805, it should be low (0V) when pulses are output to the motor.

If it moves:

- check if the filter position light switch works as in the description above.
- check if it moves just slowly, then something may be in the way that slows the speed down, or the motor may be faulty. In the last case, try changing the motor.
- if the motor stops after just a short time either the motor or the wing board (D805) is faulty. Try replacing one of them.

Er 819
“Drive Protect Error”

Displayed on PC: Drive protect switch not OK (lift and rotation), in stand

Description

This signal is used to check the proper operation of the drive protect relay (K6) on the motor board (D802). The CPU (D801) reads the signal after a short delay after releasing the activated lift or rotation button in order to check that the relay has opened and disabled motor running.

Fault elimination, trouble shooting

Normal active level 5V (test point DRIVE_PROT on D802). If the level is 0V check 24VF and K3 on the motor board or look for short circuit on the ribbon cable between D801 and D802. If the cable is OK, D802 should be replaced.

If the voltage is 30V on the test point, the ribbon cable is open or D801 faulty.

If the voltage is OK replace D801.

NOTE

There is no corresponding error for the lift & rotation drive to Compression OK error. If this fault occurs, D801 stops sending pulses to D802 and the selected motor stops. The LED V12, DRIVE_ERROR functions in the same manner as COMP_ERROR. Note that the current limit is lower when the lift motor is running downwards. If there are problems with lift or rotation operation indicating over-load, look at the DRIVE_ERROR LED to determine if the motor is overloaded.

Overloading is possible due to improper balancing (adjustment of the spring or improper loading of the lifting carriage) or improper adjustment of the rotation brake. Faulty motor, short-circuited wiring or faulty D802 are other possible causes.

Er 820
“E^2PROM write error”

Displayed on PC: Write/read back failure with EEPROM in stand

Description

If data are stored in the stand E^2PROM (D801.I34) during adjustment, a check is performed to verify whether they have been correctly stored. Should differences occur, the above-mentioned error is displayed.

Fault elimination

Repeat the attempt to write in the E^2PROM. Should this not lead to any result, in spite of repeated attempts, the board D801 must be exchanged. A reinstallation of all stand parameters must be carried out. Use the service PC to reinstall the stand parameters from floppy or disk.

Er 821
“E^{2}PROM version error”

Displayed on PC: Stand EEPROM has wrong version nbr (=old or corrupt)

Description

The version number of the stand PROM is also stored in the E^{2}PROM (D801.I34). When starting up the equipment, the version number stored in the E^{2}PROM is compared with the version number of the PROM. Should they not correspond, the above-mentioned error code is displayed on the control panel. This occurs after exchange of software version, to indicate that a new version has been installed.

Fault elimination

The version number of the new software is automatically written in into the E^{2}PROM. Switch off the equipment and then switch it on again. The error should not return.

Er 822
“Grid run error”

Displayed on PC: Grid failed to move properly

Description

The grid has to move properly from start. This is supervised by the CPU. The CPU measures the time from start till the grid has reached one of the end positions and then been able to leave it.
To check that the grid runs properly and not jams, the time for the grid to move between the two end positions is also measured the first time.
If the time for start or run check exceeds 2 sec., this error will appear.

Fault elimination, trouble shooting

Check programming of Grid fast speed (normally 80%) and Grid fast speed time (normally 500 ms).

Check the bucky board, first try another board. Make sure the grid moves freely through its whole travel in both directions.

Check the output voltage at test point GRID_M on D802. At 80% speed and nominally 30V on 24VF, GRID_M should be 30 - 0.8*30 = 6V during fast grid movement. Check for possible short circuits if the signal remains about 30V. This voltage goes to the bucky via board D805 and its relay Kl. Test point GRID_SP on D802 is the control signal from D801. It is a 5V, 20 kHz PWM signal. At 80% speed, the signal should be low about 40 µs and high about 10 µs per period. Replace D802 if the correct output is not achieved despite proper input, cabling and bucky.

Er 824
“Motor voltage error”

Displayed on PC: Stand motor voltage drops unnaturally

Description

The CPU (D801) measures voltage 24VF from the motor board (D802). If this value is below about 16V Er 824 is reported.

Fault elimination, trouble shooting

Check that the stand has voltage (generator - X14 connected, F4 OK). The stand display should be on.

Check that the Emergency Stop is not activated and that its wiring is OK.

Check that LED V49, 15V, is lit. If not, check fuses F2 and F3 on D802 in the stand.

Check voltage 24VF (measure with reference to test point 0V on D802).

Check the ribbon cable between D802 and D801.

Replace D801.

Er 825
“Pot missing error”

Displayed on PC: One or more potentiometers seems to have lost contact with stand

Description

The four potentiometers, R803-tube angle, R871-preset angle, R861-preset force and R863-thickness have their return current through signal pot_return. This is done to assure that no pot is missing or partly disconnected so that it can give a value leading to improper operation of the stand. At stand configuration or after replacing a potentiometer or the compression unit, the correct value for the signal potentiometer check must be read and stored in the stand’s E^2PROM with the Service PC Program. This error is reported if the measured value is more than 32 bits lower than the programmed value.

Fault elimination, trouble shooting

Check that all pots function properly. An error can be caused by an open connection, connector or pot. If all four pots function properly, check the programming of pot check and correct it. The need for such an adjustment may indicate a pot about to fail.

Er 826
“Pot short circuit”

Displayed on PC: There is a short circuit somewhere among potentiometers in stand

Description

The same circuitry as Er 825 is used. In this case the error indicates that the value is more than 32 bits higher than the programmed value.

Fault elimination, trouble shooting

Check the actual and programmed pot check values with the service PC program. If the value is only slightly too high, check all pots for mechanical damage or sensitivity. A short circuit (pot or wiring) should give max value for pot_check (3FF).

Err 827
“Collimator position error”

Displayed on PC: Collimator position is wrong

Description

After having positioned the collimator plate with the help of collimator position 18x24 sensor (COLL_Pl test point) the collimator position 24x30 sensor (COLL_P2 test point) is checked as an extra security. If the value of the sensor does not match the reached position the error is displayed. The value of COLL_P2 should be high (1, 5V) at the position for the 18x24 object tables.

Fault elimination, trouble shooting

Check if the two collimator position switches work as in the description above. Check cables and connectors. Check if the collimator plate moves the whole way between the two positions, otherwise see Err 816.

Er 828
“Collimator package move error”

Displayed on PC: Beam limiting device does not reach flank in time

Description

At a switch of anode material and/or focus the control function on CPU board (D801) will first move the beam limiting device (collimator package) in the direction where it will notice a change in the collimator package position sensor, a flank.

The signal from collimator package position sensor can be found at test point FOCUS_P on D801.

The test point value can also be read by the service program. “Stand tests/Switches” will show all switches. The name there is Beam limiting device. The point where the change (0->1 or 1->0, OV->5V or 5V->OV) will take place, the flank, lies in the middle of the moving area of the collimator package, and between the two positions for Molly Large focus and Wolfram Large focus.

After having reached the flank, it will output a certain number of stepping motor steps in the direction of the wished focus position.

The error is displayed if the flank cannot be sensed within a certain number of stepping motor steps.

Fault elimination, trouble shooting

Switch between W and Mo anode materials with the anode/filter combinations buttons on the control panel and check if the collimator package moves at all.

If it does not move:

- check if the CPU sends out pulses to the wing board, FOCUS_ST test point on D805, if not, check cables and connectors between D801 and D805 and maybe replace CPU board (D801) or wing board (D805).
- check voltages on wing board, 5V and 14V.
- check STEP ENABLE test point on D805, it should be low (0V) when pulses are output to the motor.
- check if it is at an end position, and the direction is into the end. Direction test point FOCUS_D at D805 should be low (0V) when moving collimator package up (towards the tube).

If something is wrong, check cables and connectors.

If it moves:

- check if the collimator package position light switch works as in the description above.
- check if it moves just slowly, then something may be in the way that slows the speed down, or the motor may be faulty. In the last case, try changing the motor.
- if the motor stops after just a short time either the motor or the wing board (D805) is faulty. Try replacing one of them.

Er 850
“Incorrect checksum for stand installation menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 1 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the stand installation menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 851
“Incorrect checksum for calibrate compression menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 2 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy is detected in the calibrate compression menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 852
“Incorrect checksum for rotation calibration menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 3 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the rotation calibration menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 853
“Incorrect checksum for rotation calibration menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 4 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the rotation calibration menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 854
“Incorrect checksum for lift parameters menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 5 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the lift parameters menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 855
“Incorrect checksum for best compression menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 6 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the best compression menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 856
“Incorrect checksum for rotation parameters menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 7 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the rotation parameters menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 857
“Incorrect checksum for beam limiting device menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 8 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the beam limiting device menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 858
“Incorrect checksum for rotation parameters menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 9 in stand EEPROM

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the rotation parameters menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Er 859
“Incorrect checksum for rotation calibration menu in stand EEPROM”

Displayed on PC: Write/Read back failure for table 10 in stand EEPROM.

Description

Each time the MAMMOMAT 3000 Nova is switched on, the adjustment data in the stand EEPROM (D801.I34) are checked with a checksum. Each menu under “Stand config” has its own checksum. If a discrepancy was detected in the rotation calibration menu, the above mentioned error is displayed.

Fault elimination

Install all stand parameters using the service PC “Back-up” menu.

Changes to previous version 5 - 1

Chap. 0		Chapter completely revised.
Chap. 4	Page 4 - 6	New information in paragraph "Fault elimination".

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